NAS1.9/4: 15/3

VOLUME 15/NUMBER 3
FEBRUARY 8, 1977
ACC. NOS. N77-11967 TO N77-12994

FEB 22 1977

STAR

AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

RECEIVED
MIAMI UNIVERSITY
LIBRARIES
FEB 22 1977
DEPOSITORY
DOCUMENTS DEPARTMENT

PRODUCED BY THE
SCIENTIFIC AND TECHNICAL
INFORMATION
OFFICE

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHAT YOU CAN DO FOR *STAR*

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those that you will transmit to NASA, DoD, or ERDA through the usual contract- or grant-reporting channels), please send them to NASA, Scientific and Technical Information Office/KSI, Washington, D.C. 20546, for consideration.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *International Aerospace Abstracts*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues...

Annual subscription rates: $66.90 domestic; $83.65 foreign. Price per single copy: $2.80 domestic; $3.50 foreign.

Cumulative index issues...

Annual subscription rates: $28.10 domestic; $35.15 foreign. Price per single copy varies according to number of pages.

Domestic subscription rates...

Apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates...

Apply to Argentina, Brazil, French Guiana, Guyana, Surinam, Belize, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

PUBLISHED BY:

UNITED STATES GOVERNMENT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SCIENTIFIC AND TECHNICAL INFORMATION OFFICE
Scientific and Technical Aerospace Reports, Volume 15, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1977.

US ISSN 0036-8741

SPECIAL NOTICE

A compilation of the summary portions of the Research and Technology Objectives and Plans *(RTOPS)* used for management and control of research currently in progress throughout NASA has been published under the title *Research and Technology Objectives and Plans Summary, Fiscal Year 1977*. It is announced as accession number N77-12925 on page 406 of this issue of *STAR*.

This *RTOP Summary* also should help expedite the NASA program of technology transfer to the private sector.

RTOP Summary FY1977 may be purchased from the National Technical InformationService, Springfield, Virginia, 22161, for $4.75 in paper copy or $3.00 in microfiche. (Customers outside the United States should add $2.50 per paper copy or $1.50 per microfiche for handling and postage charges.) The accession number N77-12925 should be specified when ordering this publication.

INTRODUCTION

Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms
- Translations in report form
- NASA-owned patents and patent applications
- Dissertations and theses

Cumulative index volumes are published semiannually and annually.

Journal, book, and conference literature, cover-to-cover journal translations, and certain foreign dissertations are announced in a companion journal, *International Aerospace Abstracts (IAA)*, available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, N. Y. 10017.

ON-GOING RESEARCH PROJECTS

By arrangement between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related *On-Going Research Projects* is inserted into each issue of *STAR*. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated *NASA Research and Technology Operating Plans (RTOPs)*, and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by *STAR* divisions but are otherwise entirely separate from *STAR*. They are not indexed nor machine-searchable by NASA. Current and retrospective searches are available from SSIE, 1730 M Street, N.W., Washington, D.C. 20036.

SUBJECT SCOPE

Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

OTHER NASA PUBLICATIONS

Other NASA publications and information services are described in the publication, *The NASA Scientific and Technical Information System ... and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

HOW TO USE STAR SUBJECT CATEGORIES

STAR is categorized by 10 major subject divisions divided into 74 specific subject categories and one general category/division. The major subject divisions are listed in the Table of Contents, together with a note for each that defines its scope and provides any cross-references. For example:

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

AVAILABILITIES

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Documents available on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche. Accession numbers followed by a plus sign (+) are not available on microfiche because of size or reproducibility.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Microfiche (1) is available regardless of age for those accessions followed by a # symbol.
Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Unit.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $3.00 price, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: ERDA Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Energy Research and Development Administration reports, usually in microfiche form, are listed in *Nuclear Science Abstracts*. Services available from the ERDA and its depositories are described in a booklet, *Science Information Available from the Energy Research and Development Administration* (TID-4550), which may be obtained without charge from the ERDA Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: ZLDI. Sold by the Zentralstelle für Luftfahrtdokumentation und -Information, Munich, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent Office. Sold by Commissioner of Patents, U.S. Patent Office, at the standard price of 50 cents each, postage free. (See discussion of patents and patent applications below.)

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number (which appears in lieu of the report number in other indexes), the U.S. Patent Number, the U.S. Patent Application Serial Number, and the U.S. Patent Class. Patent applications for which patents have not yet been issued are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02 ($3.50 domestic, $7.00 foreign). Microfiche are sold at price code A01 ($3.00 domestic; $4.50 foreign). The US-Patent-Appl-SN- number should be used in ordering either paper copy or microfiche from NTIS. Printed copies of *patents* (which are not microfiched) are available for purchase at 50 cents per copy from:

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents. Prepaid purchase coupons for ordering are also available from the Patent Office. The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

Assistant General Counsel for Patent Matters/Code GP-1
National Aeronautics and Space Administration
Washington, D.C. 20546

ELIGIBILITY AND REGISTRATION FOR NASA INFORMATION PRODUCTS AND SERVICES

A variety of services, in addition to the distribution of NASA scientific and technical reports and of *STAR* and its cumulative indexes, is available to organizations of the following types that have registered with NASA to receive specific services or products:

1. NASA offices, research centers, contractors, subcontractors, grantees, and consultants;

2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
4. Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
5. Organizations abroad that have established reciprocal document exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or for further information to:

NASA Scientific and Technical Information Facility
Attn.: Registration Activity
P.O. Box 8757
B.W.I. Airport, Maryland 21240

Organizations abroad should direct requests to the same address, but to the attention of: Foreign Exchange and Acquisitions Branch.

AVAILABILITY OF STAR ABSTRACTS ON MICROFICHE

Microfiche of the abstract sections of this issue and other issues of *STAR* are available on annual subscription from NTIS, Attn: Subscriptions, 5285 Port Royal Road, Springfield, Virginia 22161. Annual subscription rates are $45.00 North America; $90.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates. Microfiche for individual *STAR* issue abstract sections are not available.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics
and Astronautics
Technical Information Service
750 Third Ave.
New York, N.Y. 10017

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

Energy Research and Development
Administration
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Space Documentation Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information
Facility
P.O. Box 8757
B. W. I. Airport, Maryland 21240

National Aeronautics and Space
Administration
Scientific and Technical Information
Office (KSI)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration
Building
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

Zentralstelle für Luftfahrtdoku-
mentation und -Information
8 München 86
Postfach 880
Federal Republic of Germany

NTIS PRICE SCHEDULES

Schedule A

STANDARD PAPER COPY PRICE SCHEDULE

(Effective January 1, 1977)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 3.00	$ 4.50
A02	001-025	3.50	7.00
A03	026-050	4.00	8.00
A04	051-075	4.50	9.00
A05	076-100	5.00	10.00
A06	101-125	5.50	11.00
A07	126-150	6.00	12.00
A08	151-175	6.75	13.50
A09	176-200	7.50	15.00
A10	201-225	7.75	15.50
A11	226-250	8.00	16.00
A12	251-275	9.00	18.00
A13	276-300	9.25	18.50
A14	301-325	9.75	19.50
A15	326-350	10.00	20.00
A16	351-375	10.50	21.00
A17	376-400	10.75	21.50
A18	401-425	11.00	22.00
A19	426-450	11.75	23.50
A20	451-475	12.00	24.00
A21	476-500	12.50	25.00
A22	501-525	12.75	25.50
A23	526-550	13.00	26.00
A24	551-575	13.50	27.00
A25	576-600	13.75	27.50
A99	601-up	-- 1/	-- 2/

1/ Add $2.50 for each additional 100 page increment from 601 pages up.

2/ Add $5.00 for each additional 100 page increment from 601 pages up.

Schedule E

EXCEPTION PRICE SCHEDULE

Paper Copy & Microfiche

Price Code	North American Price	Foreign Price
E01	$ 3.25	$ 6.50
E02	4.75	9.50
E03	6.25	12.50
E04	7.50	15.00
E05	9.00	18.00
E06	10.50	21.00
E07	12.50	25.00
E08	15.00	30.00
E09	17.50	35.00
E10	20.00	40.00
E11	22.50	45.00
E12	25.00	50.00
E13	28.00	56.00
E14	31.00	62.00
E15	34.00	68.00
E16	37.00	74.00
E17	40.00	80.00
E18	45.00	90.00
E19	50.00	100.00
E20	60.00	120.00

E99 - Write for quote

VOLUME 15 NUMBER 3 / FEBRUARY 8, 1977

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 277

02 AERODYNAMICS 279

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 285

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 286

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 287

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 290

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 290

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 291

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 292

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 294

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 295

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 296

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 298

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 299

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 299

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 300
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 300
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 301
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 301
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 303
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 307
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 313
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 316
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics*.

31 ENGINEERING (GENERAL) 317
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 317
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 324
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 329
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 333
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 336
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 339
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 342
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 342
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 348
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 352
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 359
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 365
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 368
Includes weather forecasting and modification.

48 OCEANOGRAPHY 372
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 372
Includes genetics.

52 AEROSPACE MEDICINE 373
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 376
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 376
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY 379
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 379
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 382
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 386
Includes computer networks.

63 CYBERNETICS 387
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 387
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 391
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 393
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 393
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 393
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 393
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 394
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 395
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 396
Includes light phenomena.

75 PLASMA PHYSICS 399
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 401
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 405
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 406
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 406
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 407
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 408
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 408
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 410

89 ASTRONOMY 410
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 411
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 413
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 414
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 414
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

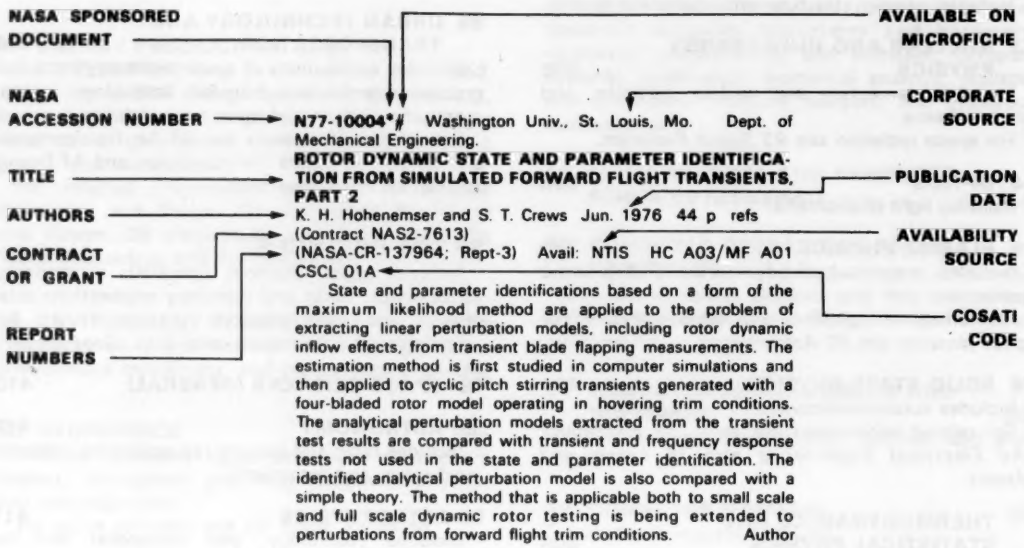
GENERAL

99 GENERAL 414

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-45
CORPORATE SOURCE INDEX I-51
CONTRACT NUMBER INDEX I-65
REPORT/ACCESSION NUMBER INDEX I-69

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
CORPORATE SOURCE
N77-10004*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
TITLE
ROTOR DYNAMIC STATE AND PARAMETER IDENTIFICATION FROM SIMULATED FORWARD FLIGHT TRANSIENTS, PART 2
PUBLICATION DATE
AUTHORS
K. H. Hohenemser and S. T. Crews Jun. 1976 44 p refs
CONTRACT OR GRANT
(Contract NAS2-7613)
AVAILABILITY SOURCE
REPORT NUMBERS
(NASA-CR-137964; Rept-3) Avail: NTIS HC A03/MF A01
CSCL 01A
COSATI CODE
State and parameter identifications based on a form of the maximum likelihood method are applied to the problem of extracting linear perturbation models, including rotor dynamic inflow effects, from transient blade flapping measurements. The estimation method is first studied in computer simulations and then applied to cyclic pitch stirring transients generated with a four-bladed rotor model operating in hovering trim conditions. The analytical perturbation models extracted from the transient test results are compared with transient and frequency response tests not used in the state and parameter identification. The identified analytical perturbation model is also compared with a simple theory. The method that is applicable both to small scale and full scale dynamic rotor testing is being extended to perturbations from forward flight trim conditions. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, AERONAUTICS AND AIR TRANSPORT RESEARCH PROGRAM
J.D. COLE, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (NSG 2171)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0002, POWER PLANT MANAGEMENT SYSTEMS FOR GENERAL AVIATION RECIPROCATING ENGINES
J.D. POWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2169)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0003, MEASUREMENT AND ESTIMATION PROBLEMS FOR AN AUTOMATIC LANDING SYSTEM
N. KYRIAKOPOULOS, George Washington University, School of Engin. & Appl. Sci., *Washington, District of Columbia* 20006 (NSG 1339)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0004, ADVANCED AVIONICS SYSTEM FOR GENERAL AVIATION
UNKNOWN, Southern Illinois University, Graduate School, *Carbondale, Illinois* 62901 (NAS 2-9310)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0005, AN ADAPTIVE CONTROLLER FOR AN AIRCRAFT GAS TURBINE PROPULSION SYSTEM
E.D. WARD, Purdue University, School of Engineering, *Lafayette, Indiana* 47907 (NSG 3119)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0006, BOUNDARY-LAYER FLOW TRANSITION AND SEPARATION IN INLETS OF V/STOL AND OTHER HIGH-PERFORMANCE PROPULSION SYSTEMS
D.C. CHOU, Univ. of Iowa, School of Engineering, *Iowa City, Iowa* 52240 (NSG 3117)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0007, COMBINED FOUR-DIMENSIONAL AREA NAVIGATION AND AIR TRAFFIC DISPLAYS APPLIED TO TERMINAL AREAS (ABBREV)
M. ATHANS, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 2180)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0008, BENEFIT-COST EVALUATION OF AN INTRA-REGIONAL AIR SERVICE IN THE BAY AREA
L.E. HAEFNER, Washington University, School of Engin. & Appl. Sci., *St. Louis, Missouri* 63130 (NSG 2170)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0009, AN ANALYTICAL STUDY OF THE INFLUENCE OF AEROELASTICITY AND FEEDBACK ON THE LATERAL/DIRECTIONAL DYNAMICS OF A TILT ROTOR AIRCRAFT
H.C. CURTISS, Princeton University, School of Engin. & Appl. Sci., *Princeton, New Jersey* 08540 (NSG 2181)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0010, WIND SHEAR DETECTION BY TOTAL ENERGY METHOD FOR USE IN LANDING OF AIRCRAFT
R.G. JOPPA, Univ. of Washington, School of Engineering, *Seattle, Washington* 98105 (NSG 2176)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, MEDIUM FIELD-OF-VIEW SENSOR DEFINITION STUDY FOR AN EARTH RADIATION BUDGET SATELLITE SYSTEM
T.H. VONDERHAAR, Colorado State University, School of Natural Sciences, *Fort Collins, Colorado* 80521 (NAS 1-14538)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0002, RESEARCH IN ORBIT DETERMINATION BY METHOD OF LEAST SQUARES AND KALMAN FILTER
J.S. BAKSHI, Fed. City College, Graduate School, *Washington, District of Columbia* 20001 (NSG 5122)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, AN EVALUATION OF POTENTIAL SPACE SHUTTLE EXPERIMENTS ON PHYSICOCHEMICAL INSTABILITIES
P. ORTOLEVA, Indiana University, School of Arts & Sciences, *Bloomington, Indiana* 47401 (NSG 1319)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0004, PROVIDE AN INDEPENDENT PERFORMANCE PREDICTION OF THE TIROS-N DATA COLLECTION SYSTEM
R.D. SHELTON, Univ. of Louisville, School of Engineering, *Louisville, Kentucky* 40208 (NAS 5-23664)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0005, A FLIGHT EVALUATION OF THE DRAG CHARACTERISTICS OF THE BELLANCA SKYROCKET II
G.M. GREGOREK, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (NSG 1327)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0006, STABILITY OF DYNAMICAL SYSTEMS
V. SZEBEHELY, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

DESCRIPTION: Based on the theory of the surfaces of zero velocity (see, for instance, 'Theory of Orbits', by V. Szebehely, Academic Press, 1967) a generally applicable method is developed to establish stability regions of a great variety of dynamical systems. The method establishes bifurcation points and catastrophe conditions and, therefore, its applicability to biological, economical, astronomical and engineering systems shows significant promise.

SUPPORTED BY University of Texas

2.0007, ROCKET/SATELLITE PROGRAM IN AERONOMY
A.B. CHRISTENSEN, Univ. of Texas, Graduate School, *Dallas, Texas* 75230 (NSG 6012)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0008, INNOVATIVE CONCEPTS IN LARGE AREA SPACE STRUCTURES
R.D. RESCH, Univ. of Utah, School of Engineering, *Salt Lake City, Utah* 84112 (NSG 1313)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0009, SPACE SHUTTLE MAIN ENGINE WHIRL PROBLEM
E.J. GUNTER, Univ. of Virginia, School of Engin. & Appl. Sci., *Charlottesville, Virginia* 22903 (NAS 8-31951)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, ACTIVE EXPERIMENTS USING ROCKET-BORNE SHAPED CHARGE BARIUM RELEASES
T.N. DAVIS, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (NSG 6014)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0002, VACUUM ULTRAVIOLET PHOTOACTIVATION OF MOLECULAR NITROGEN
J. BRAGIN, Calif. State Univ. & Colleges, School of Letters & Science, *Los Angeles, California* 90032 (NSG 7261)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0003, FORECAST OF FUTURE AVIATION FUELS
J.M. ENGLISH, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (NSG 3116)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0004, THERMAL PROTECTION MATERIAL EVALUATION AND DIAGNOSTIC STUDY OF ADVANCED HIGH-POWER ARC JETS FOR PLANETARY ENTRY SIMULATION
D. BAGANOFF, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2166)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, IGNITION OF FLAMMABLE LIQUIDS AND EFFECTIVENESS OF NACELLE FIRE KNOCKDOWN AND SUPPRESSION (ABBREV)
D.J. MYRONUK, Calif. State Univ. & Colleges, School of Engineering, *San Jose, California* 95114 (NSG 2165)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0006, THE FLUXES OF SULFUR, NITROGEN, CHLORINE AND BROMINE COMPOUNDS THROUGH THE TROPOPAUSE
B.J. HUEBERT, Colorado College, Graduate School, *Colorado Springs, Colorado* 80903 (ATM76-15148)

The research will cooperate in a series of flights to be conducted on the National Center for Atmospheric Research (NCAR) Electra aircraft during 1976. This plane, fitted with an air-scoop and filter-holder known as the 'Samovar', will make flights at 3.5 and 8 Km altitudes, from the equator to 70 degrees N. Serial filters will be used to collect (1) SO4--, Cl-, Br-, NO3, NH4 ion, H2SO4, Ca, Mg, Fe, Mn, Ni and Pb in aerosols; (2) SO2, HCl, HBr, and HNO3 on a basic-impregnated filter; and (3) NH3 on an acidic-impregnated filter. These formulae represent many of the chemical species and radicals known to be active in the chemistry of the atmosphere. The exposed filters will be returned to NCAR and Colorado College for analysis of the material collected. Development work will be undertaken to establish the optimum collection scheme and to measure collection efficiencies for the various gases under the conditions of measurements. The concentration data will be used to establish scale-heights for the species measured, which can then be used to calculate the fluxes of various compounds through the tropopause. These fluxes are needed to establish what compounds act as sources and sinks for S, N, Cl, and Br in the stratosphere.

The research flights represent preliminary efforts for larger programs aimed at investigating the chemistry of the troposphere and stratosphere including the effects of volcanic eruptions.

SUPPORTED BY U.S. Natl. Science Foundation

3.0007, ENVIRONMENTAL STRESS CRACKING OF POLYMERS
K.J. MAHAN, Univ. of Southern Colorado, Graduate School, *Pueblo, Colorado* 81001 (NSG 806)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0008, DEPOSITION OF CONDENSIBLE IMPURITIES ON SURFACES IMMERSED IN HOT GASES
D.E. ROSNER, Yale University, School of Engineering, *New Haven, Connecticut* 06520 (NSG 3107)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0009, SYNTHESIS OF THERMALLY STABLE POLYMERS FROM TRIAZOLINEDIONE INTERMEDIATES
G.B. BUTLER, State University of Fla. Sys., School of Arts & Sciences, *Gainesville, Florida* 32601 (NSG 3120)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0010, STUDY OF IMPURITY IN QUASI-ONE-DIMENSIONAL SYSTEMS
O.P. SINHA, Clark College, Undergraduate School, *Atlanta, Georgia* 30314 (NSG 7267)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0011, PERFORM MICROPROBE ANALYSIS OF ALUMINUM AND OXYGEN ON STEEL SAMPLES
J. BROWN, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (H-23602B)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0012, A KINETICS INVESTIGATION OF REACTIONS INVOLVING CHLORINE-CONTAINING COMPOUNDS
D.D. DAVIS, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NSG 1322)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0013, FRACTURE THEORY FOR PLASTICS
K.C. VALANIS, Univ. of Iowa, School of Engineering, *Iowa City, Iowa* 52240 (NSG 7257)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0014, STUDY EFFECTS OF BUOYANCY ON FLAME SPREADING ACROSS BEDS OF SOLID FUEL
R.A. ALTENKIRCH, Univ. of Kentucky, School of Engineering, *Lexington, Kentucky* 40506 (NSG 3114)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0015, SOUND TUBE MEASUREMENTS OF THE RELAXATION FREQUENCY OF NITROGEN
H.E. BASS, Univ. of Mississippi, School of Liberal Arts, *University, Mississippi* 38677 (NSG 1317)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0016, PHOTOCHEMICAL PRODUCTION OF HYDROGEN BY COPPER COMPLEXES
D.D. DAVIS, New Mexico State University, School of Arts & Sciences, *Las Cruces, New Mexico* 88001 (NSG 1332)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0017, THE STABILITY OF NEW TRANSPARENT POLYMERIC MATERIALS
E.M. PEARCE, Polytechnic Inst. of New York, School of Science & Engin., *Brooklyn, New York* 11201 (NSG 2182)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0018, STUDY OF CHROMATOGRAPHIC SEPARATION PROCESSES UNDER ZERO-GRAVITY CONDITIONS
E. GRUSHKA, State University of New York, School of Natural Sci. & Math., *Buffalo, New York* 14214 (NAS 8-31953)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0019, EFFECTIVENESS OF EMULSION TECHNOLOGY IN INCREASING EFFICIENCY OF BOILER FURNACES & REDUCING POLLUTANT EMISSIONS FROM HEAVY RESIDUAL FUELS
J.P. DOOHER, Adelphi University, School of Arts & Sciences, *Garden City, New York* 11530 (NAS 5-23688)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0020, DETERMINATION OF RADIATIVE EXCHANGE FACTORS FOR THREE-DIMENSIONAL CONFIGURATION WITH NON-DIFFUSE, NON-GRAY SURFACES
M.F. MODEST, Rensselaer Polytechnic Inst., Graduate School, *Troy, New York* 12181 (NAS 9-15109)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0021, ANALYSIS OF RESULTS OF ASTP EXPERIMENT IN ELECTROPHORESIS
J.W. VANDERHOFF, Lehigh University, School of Arts & Sciences, *Bethlehem, Pennsylvania* 18015 (NAS 8-32124)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0022, EVALUATION OF THE MECHANICAL PROPERTIES OF ELECTROSLAG REFINED FE-12 NI ALLOYS
G.K. BHAT, Carnegie Mellon University, Graduate School, *Pittsburgh, Pennsylvania* 15213 (NAS 3-20370)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0023, EFFECT OF PROCESSING PARAMETERS ON REACTION BONDING SILICON NITRIDE
M.H. RICHMAN, Brown University, Graduate School, *Providence, Rhode Island* 02912 (NSG 3118)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0024, THE CONTRIBUTION OF MOLECULAR RELAXATION IN NITROGEN TO THE ABSORPTION OF SOUND IN THE ATMOSPHERE
A.J. ZUCKERWAR, Old Dominion University, School of Sciences & Health, *Norfolk, Virginia* 23508 (NSG 1324)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, VECTOR MAGNETOMETER DESIGN STUDY
R.L. MCPHERRON, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (NAS 5-23660)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0002, VERTICAL MOTION SIMULATOR TECHNIQUE
D.B. DEBRA, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2178)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0003, HEAT TRANSFER AND HYDRODYNAMIC STUDIES ON A CURVED SURFACE WITH FULL-COVERAGE FILM COOLING
W.M. KAYS, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 3124)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0004, EFFICIENCY STUDY OF NUMERICAL METHODS FOR COMPUTATIONAL FLUID DYNAMICS
J. OLIGER, Stanford University, School of Hum. & Sciences, *Palo Alto, California* 94305 (NCA 2-745702)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, COMPUTER SIMULATION OF TRANSONIC VISCOUS FLOW PAST AIRFOILS
W.C. REYNOLDS, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NCA 2-745701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0006, ANTENNA DESIGN AND MILLIMETER-WAVE INTERFEROMETRY STUDY
R.B. LEIGHTON, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NAS 5-23696)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0007, PRELIMINARY DESIGN OF SHIPS' PASSIVE FIRE PROTECTION SYSTEMS - STRUCTURAL ENGINEERING DESIGN
H.B. SHARFSTEIN, Calif. State Univ. & Colleges, School of Engineering, *San Jose, California* 95114 (NSG 2167)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0008, EFFECTS OF TURBULENCE ON LAMINAR SEPARATION ON AERODYNAMIC SURFACES SUCH AS AIRFOIL BLADING
W.Z. SADEH, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (NSG 3127)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0009, INVESTIGATIONS OF FREQUENCY OPTIMIZATION CONVERSION OF INFRARED LASER RADIATION
C.Y. SHE, Colorado State University, School of Natural Sciences, *Fort Collins, Colorado* 80521 (NCA 2-165701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0010, VOICE RESPONSE SYSTEMS
D.M. ROBINSON, Univ. of Delaware, School of Engineering, *Newark, Delaware* 19711 (NSG 6015)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0011, THE ROLE OF LARGE-SCALE DISTURBANCES IN FLOW SURFACE NOISE GENERATION
C.K. TAM, State University of Fla. Sys., School of Arts & Sciences, *Tallahassee, Florida* 32306 (NSG 1329)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0012, ON COLOR VIDEO PROCESSING AND COMPRESSION OF MULTISPECTRAL DATA
N. AHMED, Kansas State University, School of Engineering, *Manhattan, Kansas* 66502 (NCA 2-363701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0013, A STUDY TO DETERMINE THE AQUATIC BIOLOGICAL EFFECTS ON THE SOLID ROCKET BOOSTER
R.R. COLWELL, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NAS 8-32148)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0014, IMPROVING COMMUNICATIONS BETWEEN HUMANS AND COMPUTER-DIRECTED AUTOMATIC SYSTEMS
C.J. REIGER, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (NSG 7253)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0015, OPTIMAL DESIGN METHODS FOR MULTIVARIABLE SAMPLED-DATA DIGITAL CONTROL SYSTEMS
M. ATHANS, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 1312)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0016, DESIGN AND FABRICATE A GUST GENERATOR FOR THE AMES RESEARCH CENTER SEVEN-BY-TEN-FOOT WIND TUNNEL
N.D. HAM, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NAS 2-9279)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0017, STUDY OF SHOCK BOUNDARY-LAYER INTERACTION IN TRANSONIC FLOW
M. SICHEL, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (NSG 1326)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0018, NUCLEONIC COAL DETECTOR
E.W. JONES, Mississippi St. University, School of Engineering, *Mississippi State, Mississippi* 39762 (NAS 8-32214)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0019, PHASE II SHUTTLE IMAGING RADAR EVALUATION AND STUDY
K.R. CARVER, New Mexico State University, School of Engineering, *Las Cruces, New Mexico* 88003 (NAS 9-95471)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0020, ANTENNA AND RADIOMETRIC LOSS MEASUREMENT FOR AIRBORNE INSTRUMENTATION RESEARCH PROGRAM
J.R. LACKNER, New Mexico State University, Graduate School, *Las Cruces, New Mexico* 88001 (NAS 9-95470)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0021, DIELECTRIC GRATINGS FOR THIN-FILM APPLICATIONS
T. TAMIR, Polytechnic Inst. of New York, School of Science & Engin., *Brooklyn, New York* 11201 (ENG74-23908)

A study of thin-film periodic structures, usually referred to as dielectric gratings, with emphasis on their application to devices for optical communications will be undertaken. The investigation will stress the novel guiding wave aspects of dielectric gratings with asymmetric profiles. The role of asymmetric grating profiles and their associated directional preference effects for use in beam couplers, surface-wave filters, frequency-selective mirrors for laser resonators, periodic guiding structures for distributed feedback lasers, and other applications in integrated optics will be investigated.

A complementary experimental program will be conducted.

SUPPORTED BY U.S. Natl. Science Foundation

4.0022, ARTIFICIAL COMPRESSION FOR HIGHER-ORDER SCHEMES AND, IN PARTICULAR, MACCORMACK'S SCHEME
A. HARTEN, New York University, Graduate School, *New York, New York* 10003 (NCA 2-525701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0023, STUDY OF TACTUAL SENSING AND TRANSMITTAL OF INFORMATION
R.D. GILSON, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (NSG 2179)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0024, APPLICATION OF COARSE MESH REBALANCING METHODS TO AERODYNAMIC EQUATIONS
S. NAKAMURA, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (NCA 2-565701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0025, TURBULENCE STUDY
J.K. LUERS, Univ. of Dayton, Graduate School, *Dayton, Ohio* 45409 (NAS 8-32111)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0026, GUIDED-WAVE ACOUSTOOPTIC AND ELECTROOPTIC INTERACTIONS AND DEVICES IN OPTICAL COMMUNICATION SYSTEMS
C.S. TSAI, Carnegie Mellon University, School of Engineering, *Pittsburgh, Pennsylvania* 15213 (ENG75-06563)

The objective of this research program is the study of guided-wave acoustooptical and electrooptical interactions and devices with application to optical time and frequency division multiplexing and demultiplexing as well as switching and deflection of a light beam for application in high-data-rate optical communication systems. In addition to the investigation of optical multiplexing and demultiplexing, electronic scanning and switching of a guided-light beam using a surface acoustic wave array transducer, guided-wave quasi- digital electrooptic prism deflector and electrooptic light beam scanning using phased array structures will also be examined.

SUPPORTED BY U.S. Natl. Science Foundation

4.0027, DIRECT CURRENT TRANSFORMERS WITH MAGNETORESISTIVE SECONDARIES
J.E. PAYNE, South Carolina State College, School of Arts & Sciences, *Orangeburg, South Carolina* 29115 (NSG 8044)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0028, FABRICATE AND TEST PROTOTYPE PREAMPLIFIER AND SHAPING AMPLIFIER FOR X-RAY DETECTOR PHOTO TUBE
J.F. PIERCE, Univ. of Tennessee, School of Engineering, *Knoxville, Tennessee* 37916 (NAS 5-23611)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0029, DESIGN, DEVELOPMENT, CONSTRUCTION AND OPERATIONAL TESTING OF A TRANSPORTABLE LUNAR LASER TRACKING STATION (ABBREV)
E.C. SILVERBERG, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (NASW 2974)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0030, CONSTRUCTION AND TESTING OF ROTATING SAGNAC INTERFEROMETER
V. VALI, Univ. of Utah, Graduate School, *Salt Lake City, Utah* 84112 (NASW 2967)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0031, DYNAMIC MATH MODEL OF DC MOTOR FOR AEROSPACE APPLICATIONS
N.A. DEMERDASH, Virginia Poly. Inst. & St. U., School of Engineering, *Blacksburg, Virginia* 24061 (NAS 9-15091)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0032, INVESTIGATION OF ROTOR TRANSIENT ANALYSIS BY THE MODAL METHOD
E.J. GUNTER, Univ. of Virginia, School of Engin. & Appl. Sci., *Charlottesville, Virginia* 22903 (NSG 3104)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0033, ANTENNA DESIGN AND DEVELOPMENT FOR MICROWAVE SUBSYSTEM EXPERIMENTS FOR THE TERMINAL CONFIGURED VEHICLE PROJECT
J. BECHER, Old Dominion University, School of Sciences & Health, *Norfolk, Virginia* 23508 (NSG 1331)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0034, DYNAMIC CHARACTERISTICS OF ADVANCED COMPOSITE ROTOR BLADES
G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1344)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0035, MODAL IDENTIFICATION OF STRUCTURES FROM TIME RESPONSES AND RANDOM DECREMENT SIGNATURES
G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1325)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, COASTAL SEA ICE DYNAMICS AND PROPERTIES
W.M. SACKINGER, Univ. of Alaska, School of Math. Phy. Sc. & Eng, *Fairbanks, Alaska* 99735 (R/25-03)

OBJECTIVES: To determine the ice salinity and crystal structure as a function of time during the spring melting process, to monitor the in situ stresses in the shorefast ice for as long as possible, to measure the naturally-occurring stress and strain in sea ice and brine drainage progresses, and to continue the operation of the research at Point Barrow to allow further correlation of ice motion with weather patterns.

HOW INFORMATION WILL BE APPLIED: This information will be used directly by state, federal and industry in the future development of the Arctic coast of Alaska, principally in the design and evaluation of design of such structures as offshore drilling platforms, harbor facilities and transport systems.

ACCOMPLISHMENTS DURING PAST TWELVE MONTHS: Eleven (11) publications have been produced on the following subjects: Sea Ice Dynamics, Tide and Temperature in Shorefast Ice, Morphology of Shorefast Ice, Satellite Observations of Sea Ice, Properties of Ice Lens, Offshore Permafrost, Nearshore Permafrost, Formation of Landfast Ice, Major Late-Winter Features of Ice, Stress Measurements in Ice Sheets, and Ice Motion.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0002, STRATOSPHERIC PHOTOCHEMISTRY
H.S. JOHNSTON, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (CHE75-17833 A01)

The general problem of photochemical reactions in the natural and in possibly perturbed stratosphere, including laboratory investigation of specific chemical reactions, is being studied. Work is being carried out on the photolysis of NO3, on the quantum yield of singlet oxygen from ozone, and on kinetics of the rate of reaction of HOO with hydroxyl radicals and with chlorine atoms. Further theoretical work on chemical reactions in atmosphere is also being undertaken. A.W. Brewer's work on measuring the concentration of tropospheric and stratospheric nitrogen dioxide from the differential absorption spectrum with visible light, using the sun, moon, or stars as light sources, is being extended. Some effort is being made to extend Brewer's method at several different triplets of wavelength and to confirm or modify the method. The objectives of this work are to demonstrate a relatively simple method that could be used for a program of monitoring NO2 and to establish the diurnal cycle of NO2 in the stratosphere.

SUPPORTED BY U.S. Natl. Science Foundation

5.0003, DIFFERENTIAL SCANNING CALORIMETRY OF COAL
P.I. GOLD, Calif. State Univ. & Colleges, School of Engineering, *Los Angeles, California* (NSG 7263)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0004, STUDY OF THE CHALK-ALKALINE PLUTONIC COMPLEX OF THE SOUTHWESTERN SIERRA NEVADA FOOTHILLS
W. VENNUM, Calif. State Univ. & Colleges, Graduate School, *Rohnert Park, California* 94928 (NCA 2-720701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0005, SOIL MOISTURE MODELING
R.D. BORNSTEIN, Calif. State Univ. & Colleges, School of Science, *San Jose, California* 95114 (NSG 2184)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0006, AN INVESTIGATION OF THE VARIABILITY IN THE STRATOSPHERIC DUST LAYER AS RELATED TO THE FUEGO VOLCANIC EVENT
F.G. FERNALD, Univ. of Denver, Graduate School, *Denver, Colorado* 80210 (NSG 7271)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0007, APPLICATION OF RIGID LID THREE-DIMENSIONAL MATH MODEL TO LAKE BELEWS, NORTH CAROLINA
S.S. LEE, Univ. of Miami, School of Engin. & Env. Design, *Miami, Florida* 33124 (NAS10-9005)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0008, AIRCRAFT RADIOMETER SYSTEM FOR PROJECT STORM FURY
J.W. DEES, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 5-23710)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0009, INVERSE PROBLEMS IN PHYSICS AND GEOPHYSICS
V. BARCILON, Univ. of Illinois, Graduate School, *Chicago, Illinois* 60680 (NSG 7247)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0010, IONOSPHERIC WAVES
K.C. YEH, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (ATM74-08765 A01)

This grant funds a renewal of NSF Grant GA-42857, for a continuation of Drs. K. C. Yeh and C. H. Liu's experimental and theoretical studies of ionospheric gravity waves. In particular, it funds: 1. continued experimental investigation of ionospheric gravity waves with the National Astronomy and Ionosphere Center's incoherent scatter radar at Arecibo, Puerto Rico. Wave parameters and atmospheric loss mechanisms are areas of particular interest. 2. continued experimental and theoretical studies of the coupling between the lower and upper atmospheres through gravity waves. 3. a study to try to locate and identify natural sources of gravity waves. From earlier studies, it appears that a variety of natural phenomena (thunderstorms, jet stream shear and divergence, etc.) can generate atmospheric gravity wave. 4. an investigation of a possible resonance in the equatorial ionosphere, occurring when the natural drift of ionization and the phase velocity of a gravity wave propagating through the region coincide.

SUPPORTED BY U.S. Natl. Science Foundation

5.0011, TECHNICAL COORDINATION & IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS FOR ANALOGOUS VEGETATIVE AREAS IN THE UNITED STATES & THE SOVIET UNION
M.E. BAUER, Purdue University, School of Agriculture, *Lafayette, Indiana* 47907 (NAS 9-15081)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0012, RADAR MEASUREMENTS IN AGRICULTURAL AND FORESTRY APPLICATIONS
F.T. ULABY, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NAS 9-15003)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0013, RESOURCE AND RADIOACTIVITY SURVEY IN ANTARCTICA BY AIRBORNE GAMMA-RAY SPECTROMETRY
E.J. ZELLER, Univ. of Kansas, School of Liberal Arts & Sci., *Lawrence, Kansas* 66045 (DPP75-08075 A01)

The University of Kansas will initiate a survey of radioactivity in Antarctica. A primary aim of this research project is the understanding of the distribution and concentration of radioactive elements in the different rock strata and in different tectonic environments. The research will also be important for the evaluation of ice-free areas as potential sources of radioactive-energy resources. During the initial phase of the project, special equipment was purchased, modified, tested, and adapted to use in the field with equipment already available at the University of Kansas.

Field research during the 1976-77 field season will be in the ice- free areas of the McMurdo region. Reference ground lines will be surveyed for radioactivity and the instruments then recalibrated from the air over these reference lines. Reconnaissance surveys will be made by air over other parts of the ice-free valleys. During this year the project will be in cooperation with the Federal Geological Survey of West Germany.

Three scientists from the University of Kansas and two scientists from West Germany will do field work in the McMurdo area, Antarctica.

SUPPORTED BY U.S. Natl. Science Foundation

5.0014, STUDY OF PREDICTIVE ECOLOGICAL MODELS USEFUL FOR THE MANAGEMENT AND CONSERVATION OF BERING SEA MAMMALS
G.C. RAY, Johns Hopkins University, School of Hygiene & Pub. Hlth., *Baltimore, Maryland* 21218 (NAS 2-9300)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0015, THE CREATION OF PLASMA HOLES IN THE IONOSPHERE AND THEIR POTENTIAL USE
M. MENDILLO, Boston University, School of Engineering, *Boston, Massachusetts* 02215 (NSG 7254)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0016, AN ATMOSPHERIC AND OCEANIC NITROUS OXIDE MEASUREMENT PROGRAM
M. MCELROY, Harvard University, School of Engineering, *Cambridge, Massachusetts* 02138 (NASW 2952)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0017, FEASIBILITY STUDY FOR A MICROWAVE SPECTROMETER FOR METEOROLOGICAL OBSERVATIONS FROM SYNCHRONOUS SATELLITES
D.H. STAELIN, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NAS 5-23677)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0018, THE ORIGIN OF ICE CRYSTALS IN SOUTH POLE PRECIPITATION
V.N. SMILEY, Univ. of Nevada, Desert Research Institute, *Reno, Nevada* 89507 (DPP74-04990 A02)

The major objective is to determine the heights at which ice crystals are formed in the atmosphere in the South Pole region and at which vertical extent. The sizes, fluxes, and habits of precipitated crystals will also be studied. The glaciation of cloud layers produced by homogenous nucleation or seeding by ice crystals falling from higher atmospheric layers will be investigated. A scheme will be developed for the remote measurement of water vapor and water-vapor profiles in polar atmospheres.

Three investigators will perform the field part of this research at South Pole Station during the austral summer 1976-77.

SUPPORTED BY U.S. Natl. Science Foundation

5.0019, INVESTIGATION OF ELECTRICAL CURRENTS IN THE AURORAL IONOSPHERE
R.L. ARNOLDY, Univ. of New Hampshire, School of Technology, *Durham, New Hampshire* 03824 (NSG 6013)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0020, FAR-INFRARED OBSERVATIONS OF DARK CLOUDS USING THE C-141 AIRBORNE IR OBSERVATORY
M. SIMON, State University of New York, School of Arts & Sciences, *Stony Brook, New York* 11790 (NSG 2173)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0021, DETECTION OF INCIPIENT SALINE SEEPS
L.J. BRUN, North Dakota State University, Agric. Experiment Station, *Fargo, North Dakota* 58103 (0067939; ND04526)

OBJECTIVE: Photographic and thermal imagery will be used to locate existing and potential saline seeps and to monitor changes in saline seep acreage.

APPROACH: Two areas affected by saline seeps will be overflown twice in 1975 and once in 1976 to obtain photographic and thermal imagery. Ground truth surveys will be conducted to delineate saline seep areas. Survey description will include date, location, land use, soil type, vegetation, presence of salt crusts, electrical conductivity of soil-water extract, earth resistivity measurements and possible interferring imagery. Remote sensing imagery will be correlated with ground truth data.

PROGRESS: A 22-square-mile study area near Dickinson, N.D., and a 6-square-mile study area near Mott, N.D., have been selected. Within each study area, saline seeps were located, numbered and delineated with the aid of aerial photographs. The Dickinson study area had 102 saline seeps and the Mott study area had 35 saline seeps. Each saline seep was then investigated; factors noted include location, land use, slope, aspect, class (midslope, basin, drainageway), type (potential, active with vegetation, bare surface, salt crust), vegetation, interferences (areas that might look like saline seeps from the air) and earth resistivity to quantify salinity at each seep. A soils legend for soils located in the saline seep areas has been completed. A multispectral scanning and thermal imagery flight was made in September 1975.

SUPPORTED BY North Dakota State Government - Bismarck

5.0022, DYNAMIC STRUCTURE OF STABLE ATMOSPHERIC BOUNDARY LAYER
A.K. BLACKADAR, Penn. State University, School of Earth & Min. Sci., *University Park, Pennsylvania* 16802 (NAS 8-32046)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0023, FIELD STUDY OF ADVECTION FOG
J.R. CONNELL, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916 (NAS 8-32031)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0024, APPLYING NASA REMOTE-SENSING DATA TO GEOLOGICALLY RELATED REGIONAL PLANNING PROBLEMS IN TENNESSEE
F. SHAHROKHI, Univ. of Tennessee, School of Engineering, *Knoxville, Tennessee* 37916 (NAS 8-32034)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0025, AIR POLLUTANT DISPERSION BY AIRCRAFT WAKES
J.O. LEDBETTER, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

DESCRIPTION: This study pertains to the formation and persistence of aircraft wakes and their transport of pollutants; the study especially focuses on the vortices that roll off the wings of jet aircraft. Movie films, videotapes, and radar tracks furnish the principal corroborative data.

ADDENDA: This project is also supported by: American Smelting and Refining Company and the United States Navy.

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0026, EXPERIMENTAL/ANALYTICAL PROGRAM TO ASSESS THE UTILITY OF LIDAR FOR POLLUTION MONITORING
E.C. KINDLE, Old Dominion University, School of Sciences & Health, *Norfolk, Virginia* 23508 (NSG 1343)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0027, STUDY OF THE ECONOMIC BENEFITS OF METEOROLOGICAL SATELLITE DATA
V.E. SUOMI, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (NAS 5-23706)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0028, SCIENTIFIC INVESTIGATIONS OF TROPICAL WIND, ENERGY CONVERSION AND REFERENCE LEVEL EXPERIMENT
V.E. SUOMI, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (NSG 5126)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, PREPARATION OF GUINEA PIG MACROPHAGES FOR ELECTROPHORETIC EXPERIMENTS IN SPACE
J. SAVAGE, Alabama Agric. & Mech. Univ., School of Arts & Sciences, *Normal, Alabama* 35762 (NSG 8042)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0002, PRIMATE HEMODYNAMICS AND METABOLISM UNDER CONDITIONS OF WEIGHTLESSNESS
N. PACE, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (NSG 7262)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0003, TEMPERATURE EFFECTS ON BACTERIAL PHOSPHOLIPASES
R.P. SMITH, Calif. State Univ. & Colleges, Graduate School, *Hayward, California* 94541 (NCA 2-290701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0004, CONCENTRATIONS OF THYROTRPIN LUTEINIZING HORMONES AND PROLACTIN IN THE PITUITARY
A. PARLOW, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NCA 2-390701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0005, SUPPORT OF SPECIALIZED POST-MD TRAINING IN AEROSPACE MEDICINE
R.R. BEARD, Stanford University, School of Medicine, *Palo Alto, California* 94305 (NGT 05-020-777)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0006, EVALUATION OF ENDOCRINOLOGICAL CONTROL OF GAMMA-CARBOXYGLUTAMIC ACID IN BONE
C.W. ASLING, Univ. of California, School of Medicine, *San Francisco, California* 94122 (NCA 2-665701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0007, IN VIVO STUDIES OF MUSCLE PROTEIN DEGRADATION UNDER WEIGHTLESSNESS
G.L. SEARLE, Univ. of California, Graduate School, *San Francisco, California* 94122 (NCA 2-665703)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0008, A KINETIC MODEL FOR THE ORIGIN OF THE GENETIC CODE, POLYNUCLEOTIDE EFFECTS ON AMINO ACID CONDENSATION IN CATIONIC MICELLAR MEDIA
D.H. WHITE, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA 2-685702)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0009, PHOTOCONTROL OF RHYTHMIC ION FLUX AND ELECTRICAL PARAMETERS IN PLANT CELLS
A.W. GALSTON, Yale University, School of Arts & Sciences, *New Haven, Connecticut* 06520 (NSG 2168)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0010, RECOGNITION AND TREATMENT OF CORONARY HEART ATTACKS
E.J. FISCHMANN, Howard University, School of Medicine, *Washington, District of Columbia* 20001 (NSG 5127)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0011, REGULATION OF THE ADRENAL CORTEX FUNCTION DURING STRESS
K.F. SOLIMAN, State University of Fla. Sys., Graduate School, *Tallahassee, Florida* 32307 (NSG 2183)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0012, ROLE OF THYROID HORMONES ON THERMOREGULATION OF RATS
R. ELIZONDO, Indiana University, School of Arts & Sciences, *Bloomington, Indiana* 47401 (NCA 2-335701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0013, VESTIBULAR SELECTION CRITERIA DEVELOPMENT
J.R. LACKNER, Brandeis University, School of Social Science, *Waltham, Massachusetts* 02154 (NAS 9-15147)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0014, DEVELOPMENT OF METHODOLOGIES FOR VESTIBULAR EXPERIMENTATION WITH MAN AND ANIMALS
L.H. PRATT, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (NAS 9-15106)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0015, MELATONIN AS A REGULATOR IN MAMMALIAN HIBERNATION
M.L. RIEDESEL, Univ. of New Mexico, School of Arts & Sciences, *Albuquerque, New Mexico* 87106 (NCA 2-510601)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0016, INVESTIGATION OF THE ROLE OF OXYGEN IN THE FORMATION OF ACETYL-COA SYNTHETASE IN YEAST
N.R. EATON, City University of New York, School of Science, *Brooklyn, New York* 11210 (NCA 2-75701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0017, EFFECT OF SURFACE TEXTURE BY ION BEAM SPUTTERING ON IMPLANT BIOCOMPATIBILITY AND SOFT TISSUE ATTACHMENT
D.F. GIBBONS, Case Western Reserve Univ., School of Engineering, *Cleveland, Ohio* 44106 (NSG 3126)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0018, ANALYTICAL STUDY OF ELECTROPHORETIC CHARACTERIZATION OF KIDNEY CELLS
R.J. KNOX, Univ. of Oregon, Graduate School, *Eugene, Oregon* 97403 (NAS 8-32162)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0019, PLANT ENZYME INVESTIGATION
L.H. PRATT, Vanderbilt University, School of Arts & Sciences, *Nashville, Tennessee* 37232 (NAS 9-15092)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0020, ABBERATIONS OF IMMUNOLOGICAL FUNCTIONS ASSOCIATED WITH SPACE FLIGHT (HUMAN)
L.O. GENTRY, Baylor College, School of Medicine, *Houston, Texas* 77025 (RR 00134-120110)

This project is part of a broader program (RR 00134-12) whose summary states: This application represents the second renewal application of the original project which began in 1964. Since that time there have been many significant changes. The original Bayler General Clinical Research Center was based in The Methodist Hospital and in 1968 the Unit was moved to the Ben Taub General Hospital, a hospital caring for the indigent of Harris County and managed by the Harris County Hospital District's Board of Managers. At the time of the move the Board of Managers made funds available to remodel the house officer quarters on the sixth floor of the hospital to accommodate the Unit. At the same time, Dr. Harold Brown, the Program Director, became the Chief of the Medical Service at the Ben Taub General Hospital.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - N.I.H.

6.0021, PRELIMINARY STUDIES FOR INVESTIGATION OF TISSUE LIPID PEROXIDATION
D.W. NOONER, Univ. of Houston, Graduate School, *Houston, Texas* 77004 (NCA 2-295701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0022, INFLUENCE OF HYPODYNAMIA ON THE SERUM LEVELS AND PRODUCTION OF THE ACTIVE METABOLITES OF VITAMIN D IN THE RAT
H. DELUCA, Univ. of Wisconsin, School of Agric. & Life Sci., *Madison, Wisconsin* 53706 (NCA 2-865701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, ALGORITHM DEVELOPMENT FOR MONITORING STRUCTURAL DYNAMICS
J.E. GRIMES, Calif. State Univ. & Colleges, School of Science & Math., *San Luis Obispo, California* 93402 (NCA 2-678701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0002, DECODING AND PERFORMANCE OF ERROR-CORRECTING CODES
H.J. HELGERT, George Washington University, Graduate School, *Washington, District of Columbia* 20006 (NSG 5109)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0003, OPERATION OF THE COMPUTER SOFTWARE MANAGEMENT INFORMATION CENTER
UNKNOWN, Univ. of Georgia, Graduate School, *Athens, Georgia* 30601 (NASW 2948)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0004, AN ASSESSMENT OF FUTURE COMPUTER SYSTEM FEATURES NEEDED FOR LARGE-SCALE CALCULATIONS
P. LYKOS, Illinois Inst. of Technology, School of Engin. & Phys. Sci., *Chicago, Illinois* 60616 (NCA 2-320701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0005, EVALUATION OF SOFTWARE ENGINEERING DISCIPLINES
V.R. BASILI, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NSG 5123)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0006, GENERAL SYSTEMS OF CONSERVATION LAWS
T. LIU, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (MCS75-05267)

T. P. Liu will work on the mathematical theory of general conservation laws, including those for gas dynamics equations in higher dimensions. He will investigate the relation between certain conditions, thermodynamic entropy and the 'entropy'

proposed by Lax. He will work on the asymptotic behavior of solutions to the initial- boundary value problems for nonisentropic polytropic gas equations, and the solution of the gas equations in the presence of a vacuum region.

SUPPORTED BY U.S. Natl. Science Foundation

7.0007, A CHRONOLOGY AND RETRIEVAL SYSTEM FOR WALLOPS FLIGHT CENTER ATMOSPHERIC DATA
J.C. SMITH, Univ. of Maryland, Undergraduate School, *Princess Anne, Maryland* 21853 (NSG 6016)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0008, RESEARCH IN ALGEBRAIC MANIPULATION
J. MOSES, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 1323)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0009, AN INVESTIGATION OF OPTIMIZATION TECHNIQUES FOR DRAWING COMPUTER GRAPHICS DISPLAYS
F.R. STOCKER, Penn. State University, Graduate School, *University Park, Pennsylvania* 16802 (NSG 1328)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0010, DATA ANALYSIS AND ASSOCIATED DATA STORAGE UNIT FOR INTERFEROMETER SYSTEM
T.G. BARNES, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (NAS 9-15093)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0011, COMPARISON OF EXPERIMENTAL DATA WITH MATHEMATICAL MODELS FOR COMBUSTION CHAMBER MIXING
J.C. OHARA, Texas A & I University, Graduate School, *Kingsville, Texas* 78363 (NSG 3112)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, EXPERIMENTAL SOLID-STATE RESEARCH
S. SCHULTZ, Univ. of California, Graduate School, *San Diego, California* 92037 (DMR74-24361 A02)

This is a continuation of research supported under DMR74-24361.

The conduction electron spin resonance has been measured in lithium metal with results in agreement with latest theoretical calculations. Extensions of the measurements to cesium are anticipated. Transmission electron spin resonance experiments have been extended to metal-metal bilayers. This technique has potential for the study of metallic interfaces. Extension of these experiments to interfaces with superconductors and semiconductors is planned. The theory of 1/f noise common in electronic and other systems was further developed and applied to problems in biology. Fluctuation spectroscopy was further developed and applied to the determination of molecular weight for very large molecules.

This is the 3rd year of a 3-year continuing grant.

SUPPORTED BY U.S. Natl. Science Foundation

8.0002, THEORY OF ELECTRON AND LATTICE DYNAMICS IN SOLIDS
L.J. SHAM, Univ. of California, Graduate School, *San Diego, California* 92037 (DMR73-07593 A03)

Research previously supported under DMR73-07593 will be continued and extended. The effects of interacting electrons and phonons on the properties of crystalline solids will be studied. The research may be divided into four categories: (1) Study of structural instabilities in quasi-one-dimensional conductors, where the theory developed by Sham and Patton will be extended to treat the optical properties of potassium cyano-platinide (KCP) and to calculate the temperature dependence of the lattice dynamics of TTF-TCNQ. Studies of the D.C. conductivity of these materials will also continue; (2) Investigations of the connection between lattice instabilities and high-temperature superconductivity in both A-15 and C-15 type materials; (3) Refinement of the theory of dielectric response of semiconductors developed by Sham and Hanke to treat excitonic effects in a more consistent fashion, and application to electron scattering spectra, modulation spectroscopy lineshape, synchrotron radiation absorption, and other processes; (4) The interface electromagnetic modes and the possibility of superconductivity in the inversion layer of a metal-oxide-semiconductor junction will be investigated.

SUPPORTED BY U.S. Natl. Science Foundation

8.0003, ELEMENTARY PARTICLE PHYSICS
M. GETTNER, Northeastern University, School of Liberal Arts, *Boston, Massachusetts* 02115 (PHY76-23169)

A continuing program of the measurement of pp elastic cross sections at high tranverse momentum will be conducted at Fermilab in collaboration with groups from Cornell, McGill, and the Lebedey Institute. Analysis of data already acquired for proton energies of 300 and 400 GeV and momentum transfers (4 less than t less than 10 (GeV/c)2) will be carried out. Further, additional data will be acquired over wider ranges of incident energy and momentum transfers which will bear upon the nature of the structure in the cross-sectional dependence on momentum transfer.

A modest program of analysis of data on production of bosons in pi- polarized proton interactions at 17.2 GeV wll be conducted in a collaborative effort with groups from Munich and CERN.

Knowledge important for a clearer understanding of the properties of strong interactions is expected to emerge from these efforts.

This work represents a continuation of that currently supported by Foundation grant PHY75-21592.

SUPPORTED BY U.S. Natl. Science Foundation

8.0004, THEORETICAL PHYSICS
J.N. BAHCALL, Inst. For Adv. Study, *Princeton, New Jersey* 08540 (PHY75-16298 A01)

The Institute will maintain its program of inviting theoreticians to spend a year or more with the resident Faculty. The areas of theoretical physics to be investigated are field theory, astrophysics, statistical mechanics and mathematical physics.

This work is a continuation of that currently supported by Foundation grant GMPS-7304985 A01.

SUPPORTED BY U.S. Natl. Science Foundation

8.0005, CONFERENCE ON PARTIALLY IONIZED PLASMAS INCLUDING THE THIRD SYMPOSIUM ON URANIUM PLASMAS
R. TAHN, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (NASW 2975)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0006, ELECTRONIC STRUCTURE AND ELECTRON-NUCLEAR HYPERFINE INTERACTIONS IN SOLID STATE
T.P. DAS, State University of New York, School of Arts & Sciences, *Albany, New York* 12222 (DMR76-18752)

Research in solid-state theory carried out under grant DMR72-03092 will be continued. The electronic structure and associated optical, magnetic and hyperfine (including nuclear quadrupole interaction) properties of metals and alloys will be studied. In the area of metals and alloy systems, the following shall be studied: properties of both transition-group and rare-earth ferromagnetic metals, including their pressure dependence, using first principle self-consistent band structures and wave functions.

SUPPORTED BY U.S. Natl. Science Foundation

8.0007, ELECTRONIC STRUCTURE OF METAL CRYSTALS, ALLOYS AND SURFACES
B. SEGALL, Case Western Reserve Univ., School of Arts, *Cleveland, Ohio* 44106 (DMR76-21550)

Work carried out on the electronic structure of crystals, alloys and surfaces under NSF grant DMR71-01815 will be continued. Use will be made of the Green's function formalism. An extension of a previously formulated parametrization scheme to relativistic calculations will be made. So as to study the electronics of heavy metals, an extension will also be made to the problem of the polyatomic metals. A second major area to be studied will be the electronic structure of disordered alloys. Third, a start on the problem of the band structure of thin films of the noble metals will be made.

SUPPORTED BY U.S. Natl. Science Foundation

8.0008, GROWTH OF MAGNETIC, RUTILE AND PEROVSKITE SINGLE CRYSTALS
C.T. BUTLER, Okla. St. Univ., School of Arts & Sciences, *Stillwater, Oklahoma* 74075

The growth of crystals, both pure and doped, with selected impurities for research in magnetism, optics, and other physical properties.

SUPPORTED BY Oklahoma State Government - Oklahoma City

8.0009, EFFECTS OF RADIATION ON SEMICONDUCTING AND INSULATING DIAMONDS
W.J. LEIVO, Okla. St. Univ., School of Arts & Sciences, *Stillwater, Oklahoma* 74075

A determination of electrical and optical properties of diamonds after irradiation with X-rays and high-energy particles.

SUPPORTED BY Oklahoma State Government - Oklahoma City

8.0010, RESEARCH IN THE FIELD OF ORGANIC SUPERCONDUCTORS AND SEMICONDUCTORS
H.A. POHL, Okla. St. Univ., School of Arts & Sciences, *Stillwater, Oklahoma* 74075

Research on the possibility of obtaining organic superconductors and/or semiconductors including the related areas of organic magnetics, organic conductors, and organic photoconductors.

SUPPORTED BY Minnesota Mining & Manuf. Co. - St. Paul

8.0011, THEORY OF MANY-PARTICLE SYSTEMS
M.D. GIRARDEAU, Univ. of Oregon, School of Liberal Arts, *Eugene, Oregon* 97401 (DMR76-17467)

An investigation initiated under NSF Grant DMR72-03211 to understand the connection between quantization of circulation and metastability of superfluid flow in microscopic detail will be continued. The model system consists of an ideal Bose gas initially in rotation with respect to a cylindrical container at rest. The cylinder has a local roughness in this model of a nonequilibrium condition. The approximate vortex trajectories calculated thus far will be refined and a larger range of initial conditions and wall perturbations will be investigated, with the object of identifying criteria separating the region of metastable flow from that of decaying flow. The model will be generalized to include other features present in real liquid helium-4. The standard form of linear transport theory is inadequate to correctly predict the nonequilibrium statistical mechanics of persistent currents in superfluids and superconductors. Nonlinear methods of treating this problem will be investigated in simple models, and a modified form of linear transport theory adequate to deal with such situations will be developed. Work will continue on the construction of second quantization representations for systems of composite particles and their application to various areas of low-temperature physics.

SUPPORTED BY U.S. Natl. Science Foundation

8.0012, STUDIES OF VISCOUS LIQUID CRYSTALS
M.P. EASTMAN, Univ. of Texas, School of Science, *El Paso, Texas* 79902 (NSG 1316)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0013, EFFECT OF THERMAL NEUTRON IRRADIATION ON THE ELASTIC MODULI AND STRUCTURE OF BORON-CONTAINING CRYSTALS
H. OZKAN, Middle East Tech. University, *Ankara, Turkey* (1800/RB)

This investigation aims to study the effect of thermal neutron irradiation on the elastic moduli and structure of boron-containing crystals. Boron-containing crystals undergo neutron radiation damage due to the B510 (n, lambda) nuclear reaction. This (n, lambda) reaction of B10, which occurs with large cross section (4000 barn), produces two different energetic fragments which may generate large displacement cascades. The effect of the (n, lambda) nuclear reaction of B10 in boron-containing crystals is analogous to (a) the fission fragment damage process in uranium-doped ceramic materials, and (b) the metaminetization process occurring in some natural minerals containing radioactive impurities.

In the first year boron-containing tourmaline single crystals, which are used as high-temperature transducer material because of their piezoelectric properties, will be irradiated by thermal neutrons in the TR-1 reactor at CNAEM. X-ray structural studies and elastic measurements by ultrasonic techniques prior to and after different neutron fluxes will be carried out. In the following years, similar studies will be extended to other boron-containing crystals of interest. The observed radiation-damage effect on boron-containing crystals will be compared and correlated with the known effect of metaminetization of zircons and fission-fragment damage in some ceramic materials. Observation of different boron-containing crystals will not only provide information about the radiation stability of these crystals but also will help to establish the relation of radiation damage to the crystal structure and chemical composition of these crystals.

SUPPORTED BY Internat. Atomic Energy Agency - Austria

8.0014, THEORY OF PLASMA WAVES IN THE EARTH'S BOW SHOCK
S.P. GARY, Coll. of William & Mary, School of Arts & Sciences, *Williamsburg, Virginia* 23185 (E(40-1)-5090)

OBJECTIVES: We propose to carry out a theoretical investigation of possible plasma instabilities in the earth's bow shock by the following procedure: (1) Solving the complete electromagnetic, Vlasov, linear dispersion relation for conditions appropriate to perpendicular shocks, (2) thereby identifying the dominant instabilities, and (3) then constructing appropriate nonlinear theories to determine saturation mechanisms and turbulent scattering frequencies. These frequencies could then be used to determine heating rates and to predict shock thicknesses which could be directly compared with observations in the earth's bow shock.

RESULTS: A computer program has been written to evaluate the dispersion relation for the case of unmagnetized ions and magnetized electrons undergoing a yields over E X yields over B drift. The results show significant differences with the electrostatic results for the modified two-stream stability.

SUPPORTED BY U.S. Energy Res. & Dev. Admin. - P.R.D.

8.0015, PLASMA PHYSICS RESEARCH
D.W. KERST, Univ. of Wisconsin, School of Letters & Science, *Madison, Wisconsin* 53706 (E(11-1)-2387)

OBJECTIVES: To examine plasma confinement in stable confinement fields and to determine diffusion coefficients and particle loss processes; To learn how to heat plasmas; To examine impurity release from walls; To experiment with divertor action. These tests are possible on our levitated octupole, our supported octupole and on our D.C. internal ring. The theory associated with the experiments and the diagnostics are to be developed.

RESULTS: Scaling laws for diffusion appear to indicate convective action. This gives B independence and 1 over n or 1 over the square root of n diffusion with toroidal field or without, respectively. Heating by ion cyclotron resonance has been steadily improved so 350 eV ion temperature is assured. Processes leading to hot ions formed during ECRH have had some study. Impurity release from walls has been reduced by special wall treatment.

SUPPORTED BY U.S. Energy Res. & Dev. Admin.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SHUTTLE COMET RESEARCH
E. STUHLINGER, Univ. of Alabama, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-32225)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0002, THE NATURE AND ORIGIN OF ORGANIC COMPOUNDS IN CARBONACEOUS METEORITES
J.R. CRONIN, Arizona State University, School of Liberal Arts, *Tempe, Arizona* 85281 (NSG 7255)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, STUDY OF STRAY LIGHT SUPPRESSION FOR THE LARGE SPACE TELESCOPE
P.N. SLATER, Univ. of Arizona, Optical Science Center, *Tucson, Arizona* 85721 (NAS 8-32127)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, ANALYSIS OF CLOUD MOTIONS IN THE PIONEER 10 AND 11 PHOTOGRAPHS OF JUPITER
B.A. SMITH, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 7265)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, ESTABLISH AND OPERATE A SPACE IMAGERY CENTER
R.G. STROM, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NASW 2944)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0006, SIMULTANEOUS X-RAY, OPTICAL AND ULTRAVIOLET OBSERVATIONS OF X PERSEI
C.S. BOWYER, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (NSG 5114)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, ANALYSIS OF MOLECULAR SPECTRA
J.G. PHILLIPS, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (AST76-05905)

The successful study of molecular structures, excitations and abundances in astrophysical sources requires the support of extensive and reliable laboratory information on molecules of interest. This information includes measures, transition identifications, relative and absolute transition probabilities and dissociation energies. The goal of this program is to provide astrophysicists with as much as possible of this pertinent information. The analysis of ZrO will be completed. The molecules CN, YO, VO, LaO and CH4 will be investigated next. A program to measure the lifetimes of excited molecular states will be begun. Computer-generated synthetic spectra of ZrO will be compared with electronic furnace spectrograms and photoelectric scans to derive the relative transition probabilities of as many vibrational and electronic systems as can be produced in the furnace. The laboratory measures, analyses and transition probabilities will be applied to the molecular spectra found in cool stars.

SUPPORTED BY U.S. Natl. Science Foundation

10.0008, INTERFACE DEFINITION STUDY OF ULTRAVIOLET IMAGING TELESCOPE
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NAS 5-23697)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0009, STUDY OF CONTROL SYSTEM CONCEPTS FOR THE SPACELAB INFRARED TELESCOPE FACILITY
J.D. POWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NAS 2-9304)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0010, THEORETICAL ANALYSES OF RELATIVISTIC GRAVITATIONAL EXPERIMENTS
C.M. WILL, Stanford University, Graduate School, *Palo Alto, California* 94305 (NSG 7204)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0011, EXTERNAL GALAXIES AND QUASI-STELLAR OBJECTS
E.M. BURBIDGE, Univ. of California, Graduate School, *San Diego, California* 92037 (AST74-19471 A02)

This program includes both observational and theoretical extragalactic research. Work will be done on quasars, on BL Lacertae objects, on radio galaxies, and on other interesting galaxies. Data will be obtained at Lick Observatory, Kitt Peak National Observatory, and Cerro Tololo Inter-American Observatory. Observations shall be obtained of the spectra of quasars, some of it survey work in order to produce red shifts and line strength data for complete and well-defined samples of faint radio-emitting objects, some of it higher precision work in order to obtain accurate data for theoretical studies of the structure and physical nature of the emitting regions in quasars. Quasars with multiple red shifts will be studied. Work will be done in some very interesting BL Lacertae objects which will help in achieving an understanding of the emission processes and physical structure of these objects. Identification and red shift work will be done on very distant radio galaxies. Research will be done to determine the chemical composition of galaxies that may be at a very different evolutionary stage from that of our own galaxy.

The above research is related to basic problems concerning the evolution of galaxies, the nature of quasars, cosmology and the chemical evolution of the universe. This research will help toward eventual understanding of the physical processes and energy production in the strong sources of non-thermal radiation, and of the explosive events that generate these sources.

SUPPORTED BY U.S. Natl. Science Foundation

10.0012, COSMIC-RAY DOSIMETRY
A.B. TUCKER, Calif. State Univ. & Colleges, School of Science, *San Jose, California* 95114 (NSG 2177)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0013, INVESTIGATION OF PHOTON-COUNTING IMAGING DETECTOR FOR SPACE TELESCOPE
G.M. LAWRENCE, Univ. of Colorado, School of Arts & Sciences, *Boulder, Colorado* 80302 (NSG 5124)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0014, MEASUREMENT OF SOLAR SPECTRA COVERING THE REGION BETWEEN 3500A AND 7000A
D.G. MURCRAY, Univ. of Denver, School of Arts & Sciences, *Denver, Colorado* 80210 (NSG 1333)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0015, INFLUENCE OF CLOUDS ON UV-B PENETRATION OF THE EARTH'S SURFACE
A.E. GREEN, State University of Fla. Sys., School of Engineering, *Gainesville, Florida* 32611 (NAS 9-15114)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0016, DESIGN FORWARD LIGHTED SOLAR CONCENTRATORS FOR SPACE APPLICATIONS
D.G. BURKHARD, Univ. of Georgia, School of Arts & Sciences, *Athens, Georgia* 30602 (NAS 8-32149)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0017, STRUCTURE OF THE LOCAL UNIVERSE AND THE STATISTICAL PROPERTIES OF GALAXIES
R.B. TULLY, Univ. of Hawaii, Graduate School, *Honolulu, Hawaii* 96822 (AST76-12159)

The radio waves from hydrogen have been detected from some 900 nearby galaxies, the vast majority observed for their red shift for the first time. When the data are combined with other data on approximately 600 red shifts in the literature, it will be possible to map the extragalactic neighborhood out to a red shift equivalent to a velocity of 300 km/s in much greater detail than possible previously. Within a velocity of 1000 km/s our sample should be complete for all but extreme systems. In addition to red shifts, the hydrogen flux (HI mass) and a line profile width which is related to total mass will be measured. Of major importance is that a correlation exists between the profile width and absolute galaxy luminosity which promises to provide a superior method of obtaining distances to galaxies. Consequently, all of the candidates can be potentially located three-dimensionally in space independently of red shift. Some of the major questions we hope this wealth of data will resolve are: (a) How do galaxies tend to group in scales from small groups through to the supercluster? (b) Are these groups or the supercluster stable or dissipating? (c) How much angular momentum do these groups or the supercluster contain? (d) Is the Hubble expansion isotropic locally and what is the Hubble constant? (e) Is there evidence within groups of non-Doppler red shifts? (f) What is the luminosity function of galaxies based on this 'complete' sample? (g) What are the statistics of the morphological properties of galaxies, including peculiarities?

SUPPORTED BY U.S. Natl. Science Foundation

10.0018, SIMULATION OF MARTIAN EOLIAN PHENOMENA
J.D. IVERSEN, Iowa State Univ. of Sc. & Tech, School of Engineering, *Ames, Iowa* 50011 (NCA 2-340701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0019, PRELIMINARY MISSION STUDY OF THE HAWKEYE AURORAL PHYSICS EXPLORER
J.A. VANALLEN, Univ. of Iowa, School of Liberal Arts, *Iowa City, Iowa* 52240 (NAS 5-23726)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0020, STUDY FOR ADAPTING TWO EXISTING ROCKET TELESCOPE SYSTEMS FOR SPACELAB
W.G. FASTIE, Johns Hopkins University, School of Arts & Sciences, *Baltimore, Maryland* 21218 (NAS 5-23695)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0021, COLLOQUIUM ON COMPARATIVE PLANETOLOGY
C. PONNAMPERUMA, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NSG 7260)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0022, ANALYSIS AND INTERPRETATION OF X-RAY DATA
W.K. ROSE, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NSG 7252)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0023, STUDY OF DIGITAL IMAGE PROCESSING OF ASTRONOMICAL SCENES
A. ROSENFELD, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NCA 5-13)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0024, EXTREME ULTRAVIOLET AND SOFT X-RAY SCIENCE STUDY
S.A. RAPPAPORT, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (NAS 5-23658)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0025, VARIABLE STARS
D. HOFFLEIT, Maria Mitchell Observatory, *Nantucket, Massachusetts* 02554 (AST76-15444)

Stars which vary in brightness and color are called variable stars. Their variations usually result from a rhythmical change in the extent of the star's atmosphere - a pulsation phenomenon. Results from investigations of types and periods of variable stars are of immense use for studies of the structure of our Milky Way Galaxy as well as of other nearby galaxies in space. The investigations of changing periods of pulsation of variable stars aids in testing theories of stellar structure. Additional data are needed to determine period lengthening, shortening, or constancy. This kind of research is very long term. The Maria Mitchell Observatory is well equipped for photographic analyses of variable stars brighter than 16th photographic magnitude. Its photographic plate collection exceeds 5600 plates which span a time period of more than 50 years. The research to be done will concentrate on studying the periods of stars whose periods are changing. Periods will be determined too, for the class of star known as symbiotic stars.

SUPPORTED BY U.S. Natl. Science Foundation

10.0026, STUDIES OF CHEMICALLY PECULIAR STARS
C.R. COWLEY, Univ. of Michigan, School of Lit. Sci. & the Arts, *Ann Arbor, Michigan* 48104 (AST76-20259)

High-resolution studies will be carried out of a larger sample of slowly rotating and chemically peculiar stars. Identification will be made of the various chemical elements present in the star's spectra. The elemental abundances will be determined. The proposed project duration will allow wavelength measurements, preliminary element identifications, and selected abundance determinations to be completed for 15 to 20 sharp-spectral-lined stars. The technique will be employed on the four subdwarf stars HD 19445, 140283, and 161817, and RR Lyrae as well. The point of the research is to establish the systematics of the chemical peculiarities in these stars, especially of the trace elements.

SUPPORTED BY U.S. Natl. Science Foundation

10.0027, ULTRAVIOLET OBSERVATIONS OF SO GALAXIES
J.S. GALLAGHER, Univ. of Minnesota, Inst. of Technology, *Minneapolis, Minnesota* 55455 (NSG 7259)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0028, EXPERIMENT DEFINITION AND INTEGRATION STUDY OF ADAPTING A PRESENT COSMIC-RAY DETECTOR FOR SPACELAB
C.J. WADDINGTON, Univ. of Minnesota, Inst. of Technology, *Minneapolis, Minnesota* 55455 (NAS 5-23684)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0029, RESEARCH IN EXTRAGALACTIC ASTROPHYSICS
N.A. BAHCALL, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (NSG 7256)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0030, GALACTIC AND EXTRAGALACTIC ASTROPHYSICS
N.A. BAHCALL, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (AST76-15386)

The main thrusts of the research to be carried out are: 1) Observational determination of the structure, contents and properties of rich clusters of galaxies and their possible application to cosmological models; 2) Detailed optical studies of X-ray sources including unidentified high galactic latitude sources, rich clusters of galaxies, and globular star clusters.

The first is important for the understanding of the dynamics and formation of clusters of galaxies, which are the largest easily studied units in the universe. The observations may be useful in determining the angular-size-versus-distance relation and thus new observational constraints on the cosmological deceleration parameter, which formally describes the large-scale structure of the universe. The second study consists of identifying and understanding the nature of the new objects currently being discovered by satellites which are observing the extremely interesting X-ray sources.

SUPPORTED BY U.S. Natl. Science Foundation

10.0031, STUDIES OF BACKGROUND STARLIGHT
J.L. WEINBERG, State University of New York, Graduate School, *Albany, New York* 12203 (NSG 7241)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0032, OPPORTUNITY OCCULTATION STUDIES OF PLANETS, SATELLITES AND ASTEROIDS
J.L. ELLIOT, Cornell University, Center For Radioph. & Sp. Res., *Ithaca, New York* 14850 (NSG 2174)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0033, GRAVITATIONAL TIME DELAY IN ORTHOGONALLY POLARIZED RADIATION PASSING BY THE SUN
M. HARWIT, Cornell University, School of Arts & Sciences, *Ithaca, New York* 14853 (NSG 7268)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0034, DETERMINATION OF METAL ABUNDANCES IN DISTANT K-GIANT STARS
H.L. HELFER, Univ. of Rochester, School of Arts & Sciences, *Rochester, New York* 14627 (AST75-22206)

Photometric metal abundances will be determined for K spectral-type giant stars in galactic star clusters. These abundances will allow a study of the temporal variation of the iron-to-hydrogen ratio during the last few billion years. There is observational evidence that the iron- to-hydrogen ratio may have decreased in the last billion years. It is important to obtain a large enough sample of objects to avoid statistical uncertainties in investigating this possibility. Photometric metal abundances of K-giant stars will be determined along very long lines of sight -- about 10 kiloparsecs in length -- in the galactic plane. These data will permit one to obtain the special variation of the iron-to-hydrogen ratio. Recent research shows that such special variations do occur. The author has demonstrated techniques necessary to successfully carry out this task. Considerable effort will be directed to developing an efficient computer program for reducing magnetic types of micro-densitometer tracings of photographic plates of crowded star regions in order to select stars of a given magnitude and color range for subsequent photoelectric photometry.

SUPPORTED BY U.S. Natl. Science Foundation

10.0035, TRANSPARENT OVERLAY MAPS FOR THE PALOMAR-NATIONAL GEOGRAPHIC SOCIETY SKY SURVEY
J.D. KRAUS, Ohio State University, School of Engineering, *Columbus, Ohio* 43212

Sets of computer-drawn transparent overlay maps for use with the Palomar-National Geographic Society Sky Survey photographs will be prepared and distributed at cost. The overlays will show the names, positions, and sizes of all known non-steller objects, as given in the Master List of Non-Stellar Optical Astronomical Objects. Other features to be shown on the overlays include the brighter SAO stars, epoch 1950.0 equatorial coordinate grid lines, known plate defects and ghost images, popular star names, galactic coordinate indications, and the Standard Areas. The average density of objects to be shown is about one per square inch.

The overlays will also be useful by themselves as maps, to locate specific objects or regions. They can be studied to reveal effects such as clustering, or to search for coincidences and proximities among objects of nominally different or of the same types.

It is anticipated that the cost of a set of overlays will be about 15% of the cost of the photographs themselves.

SUPPORTED BY Natl. Geographic Soc. - Washington, D.C.

10.0036, LABORATORY INFRARED RESEARCH RELEVANT TO ATMOSPHERIC AND PLANETARY STUDIES
K.N. RAO, Ohio State University, School of Math. & Phys. Scis., *Columbus, Ohio* 43210 (NSG 2175)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0037, RADIATION PROCESSES IN CLOUDY AND HAZY ATMOSPHERES
K. LIOU, Univ. of Utah, School of Mines & Mineral Ind., *Salt Lake City, Utah* 84112 (ATM75-05216 A01)

The objective of this research is to develop a reliable and accurate radiation program for cloudy and hazy atmospheres. Efforts will be devoted to constructing a comprehensive and standard program for both solar and infrared radiation for at-

mospheres containing gases, aerosols, and especially clouds. This comprehensive radiation model will be used to examine the climatic effects of clouds and aerosols and to derive simplified parameterization equations. A conceptual approach for the parameterization of radiative transfer will also be developed for applications to realistic atmospheres where clouds and other atmospheric parameters vary randomly around their mean values in a three-dimensional space.

The radiative properties of cirrus clouds in the solar spectrum will be investigated experimentally. Determination of the wavelength- dependent phase functions and extinction cross-sections of ice crystals typical of those in cirrus clouds will be carried out in the laboratory. Results will be incorporated into the transfer program to evaluate effects of cirrus clouds on the radiation field of the earth's atmosphere. Preliminary mathematical analyses have been carried out for radiative transfer in finite clouds. Simplified procedures will be used to seek a numerical solution to the three-dimensional transfer equation.

SUPPORTED BY U.S. Natl. Science Foundation

10.0038, SCIENCE AND SOFTWARE SUPPORT FOR SPACECRAFT SOLAR OCCULTATION EXPERIMENTS
W.P. CHU, Old Dominion University, School of Sciences & Health, *Norfolk, Virginia* 23508 (NSG 1341)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GENERAL

11.0001, EXPERIMENTAL AND ANALYTICAL ENGINEERING AND APPLIED SCIENCE SUPPORT OF LANGLEY RESEARCH CENTER PROGRAMS
H. LIEBOWITZ, George Washington University, School of Engin. & Appl. Sci., *Washington, District of Columbia* 20006 (NAS 1-14605)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0002, GRADUATE RESEARCH PROGRAM IN ADVANCED AEROSPACE STRUCTURES
I.W. JONES, Howard University, School of Engineering, *Washington, District of Columbia* 20001 (NSG 1320)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0003, A STUDY OF POTENTIAL TECHNOLOGY UTILIZATION ASSISTANCE
UNKNOWN, State University of Fla. Sys., Graduate School, *Gainesville, Florida* 32601 (W-14206)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0004, MICROPROCESSOR UTILIZATION IN SEARCH AND RESCUE MISSIONS
M. SCHWARTZ, Columbia University, Graduate School, *New York, New York* 10027 (NAS 5-23727)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0005, NASA/JSC RADAR WORKSHOP
R.I. WELCH, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NAS 9-15125)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

VOLUME 15 NUMBER 3 / FEBRUARY 8, 1977

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N77-11967*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 74
Sep. 1976 94 p
(NASA-SP-7037(74)) Avail: NTIS HC $4.00 CSCL 01A

This special bibliography lists 295 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1976. Author

N77-11968*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW-SPEED WIND-TUNNEL INVESTIGATION OF FLIGHT SPOILERS AS TRAILING-VORTEX-ALLEVIATION DEVICES ON A MEDIUM RANGE WIDE-BODY TRI-JET AIRPLANE MODEL
Delwin R. Croom, Raymond D. Vogler, and Geoffrey M. Williams (Lockheed-California Co., Burbank) Washington Nov. 1976 47 p refs
(NASA-TN-D-8360; L-11103) Avail: NTIS HC A03/MF A01 CSCL 01B

An investigation was made in the V/STOL tunnel to determine, by the trailing wing sensor technique, the effectiveness of various segments of the existing flight spoilers on a medium range wide body tri-jet transport airplane model when they were deflected as trailing vortex alleviation devices. The four combinations of flight spoiler segments investigated were effective in reducing the induced rolling moment on the trailing wing model by as much as 15 to 60 percent at distances behind the transport model of from 3.9 to 19.6 transport wing spans, 19.6 spans being the downstream limit of distances used. Essentially all of the reduction in induced rolling moment on the trailing wing model was realized at a spoiler deflection of about 45 deg. Author

N77-11969# Advisory Group for Aerospace Research and Development, Paris (France).
NUMERICAL METHODS AND WINDTUNNEL TESTING
Oct. 1976 206 p refs Partly in ENGLISH and FRENCH; ENGLISH summaries Papers presented at the Fluid Dyn. Panel Specialists Meeting, Von Karman Inst. for Fluid Dyn., Rhode-St-Genese, Belgium, 23-24 Jun. 1976
(AGARD-CP-210; ISBN-92-835-0178-0) Avail: NTIS HC A10/MF A01

Wind tunnel stability tests for various aerodynamic configurations are presented, emphasizing low speed and transonic wind tunnels. Some data processing was performed with minicomputers, some of which processed in real time. For individual titles, see N77-11970 through N77-11986.

N77-11970# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
DIGITAL COMPUTER ASPECTS OF THE INSTRUMENTATION AND CONTROL OF THE NEW RAE 5 METRE LOW SPEED TUNNEL **c09**
R. J. North, R. W. Jeffery, J. A. Dolman, and A. N. Tuck *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 10 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

An account is given of the applications of online and offline minicomputers in its instrumentation and control systems. Some of the hardware and software design considerations are discussed; various options for future development are outlined. The connections with the control computers and other ancillary systems are mentioned. Author

N77-11971# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Centre de Modan Avrieux.
OPERATIONAL USE OF COMPUTERS ASSOCIATED WITH THE MODANE WIND TUNNELS **c09**
Gerard Grenat *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 9 p refs In FRENCH; ENGLISH summary (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Measuring units for wind tunnels of the Modane-Avrieux Centre were gradually equipped with minicomputers for insuring the following functions: measurement acquisition management, test control and monitoring, and automatic operations. Multitask type software offers a great flexibility for dialogue with the experimenter and allows an exchange of informations with the outside, at a rate close to that of a stand alone computer. The whole system is operational since April 1975. Three applications are described: two dimensional profile tests, convertible rotor tests with real time simulation of rotor tilting, and device for weighing missiles close to the aircraft with a view to calculate step by step the missile relative trajectory (captive trajectory method). These examples outline the functions entrusted to the computers associated to measuring units, the loads they can withstand, and the limits of their possibilities. Author

N77-11972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATIONS OF THE REAL-TIME DATA ANALYSIS SYSTEM IN THE AMES 40- BY 80-FOOT WIND TUNNEL **c09**
Mark W. Kelly, Stanley O. Dickinson, and Everett E. Maynard *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 10 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01 CSCL 14B

The first major overhaul and refurbishment of the Ames 40- by 80-foot wind tunnel since it was put into operation in 1944 was recently completed. A substantial part of this refurbishment was devoted to providing this wind tunnel with a modern real time data acquisition and analysis system to increase the safety, efficiency, and accuracy of experimental investigations in this facility. Background leading to the requirements for the new system, major elements of the system, and some of the applications of the system are summarized. The potential of computerized data acquisition systems for wind tunnels in terms of long term trends in hardware and software costs, and the constraints which must be dealt with to achieve the

full potential of computerized data acquisition systems are discussed. Author

N77-11973# Boeing Vertol Co., Philadelphia, Pa.
THE USE OF COMPUTERS IN ROTARY WING TESTING **c05**
William G. S. Hardy and Edward J. Pyne *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 12 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Computer requirements for testing rotary wing aircraft models are discussed, and a general purpose processing system is described. Some considerations for data acquisition and presentation are presented. The types of analyses required for rotary wing models are covered. Both real time and off-line analysis methods are reviewed. Author

N77-11974# Arizona Univ., Tucson.
SOME EXPERIENCES WITH THE EXPLOITATION OF MEASUREMENTS OF THE PERTURBATION FIELD IN A WIND TUNNEL TO IMPROVE SIMULATION **c09**
W. R. Sears *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 4 p Prepared in cooperation with Calspan Corp. (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

The essential feature is that both the flow within the tunnel and the computed exterior field are iteratively adjusted to achieve the matching. The tunnel flow is adjusted by mechanical changes of tunnel wall geometry, for example, by varying the pressures in subdivided plenum chambers surrounding the working section and communicating with the tunnel through porous walls or slots. The exterior flow field is adjusted by altering the boundary values prescribed at S, on the basis of measurements of flow perturbation distributions at or near S. Author

N77-11975# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
APPLICATION OF THE COMPUTER FOR ON-SITE DEFINITION AND CONTROL OF WIND TUNNEL SHAPE FOR MINIMUM BOUNDARY INTERFERENCE **c09**
M. Judd, M. J. Goodyer, and S. W. D. Wolf *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 14 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

The use is described, of flexible top and bottom walls, as a means of eliminating or minimizing wall interference effects on two dimensional wind tunnel models. Strategies for producing streamline contours and their extension to three dimensions are discussed. Errors due to theoretical assumptions and practical implementation are explored so that computational resolution can be made consistent. The need for efficient and rapidly convergent algorithms for wall adjustment is stressed and discussed. These must be developed in order to reduce the current data acquisition times and make feasible the present aim to incorporate an on-line minicomputer for automatic wall control. Results are presented showing the correctness of the strategies used with manual wall adjustment. Author

N77-11976# Avions Marcel Dassault, Saint-Cloud (France).
ADAPTATION OF THE JOPPA METHOD TO A WIND TUNNEL WITH VARIABLE PERMEABILITY [ADAPTATION DE LA METHODE DE JOPPA A UNE SOUFFLERIE A PERMEABILITE VARIABLE] **c09**
Jean-Ch. Vayssaire, M. Langot (Institut Aerotechnique de Saint-Cyr), and M. Menard (Institut Aerotechnique de Saint-Cyr) *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 17 p refs In FRENCH (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

The Joppa calculation method divides the walls of a wind tunnel working section into rectangular elements with an unknown vortex ring strength and takes account of the test section dimensions and boundaries. The relative position of the model, as well as its geometry and lift distribution spanwise allow the calculation of the theoretical permeability in any point of the ventilated walls to minimize or cancel its effect in the area of the model. Inside the plenum chambers which are around the test section of the Sigma 4 wind tunnel, flexible, solid, and movable plates are found. The movement of the plates contributes to the variation of the permeability in any point of the working section perforated walls. Author

N77-11977# ARO, Inc., Arnold Air Force Station, Tenn.
AUTOMATIC CONTROL OF A TRANSONIC WIND TUNNEL WITH A REAL-TIME COMPUTER SYSTEM **c09**
J. A. Gunn and J. P. Christopher, Jr. *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 6 p ref (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

The aerodynamic wind tunnel (4T) real time control and display system is a computerized system which has increased the productivity of the tunnel 4T tests by providing real time displays of test conditions, test condition monitoring, and automatic control. The system is built around a PDP 8/E minicomputer which has a 16K word memory and a hardware floating point processor. The system uses standard tunnel measurements to calculate stream and plant parameters. The program, which is written in the FORTRAN 4 language, is executed three times per second. Computer-driven video displays provide tunnel operators and other control room personnel with test conditions such as Mach number, Reynolds number, and dynamic pressure. The real time system monitors all test parameters, continually checks to determine if test conditions are as requested, and informs the operators of the current plant and test conditions status via the status panel. The real time system automatically controls the test section wall porosity, ejector flaps, wall angle, the tunnel stagnation pressure for most conditions, and the Mach number in the range from 0.2 to 0.9. Author

N77-11978# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MINIMIZING WALL INTERFERENCE IN CONNECTIONAL TRANSONIC TEST SECTIONS BY USING COMPUTER PARAMETRIC STUDIES **c09**
Xavier Vaucheret *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 23 p refs In FRENCH; ENGLISH summary (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Parametric studies by computer, using the programs for the calculation of the wall interference by the analytic method, for perforated wall transonic test sections, allow the determination of using of present test sections, with associated model sizing, so that the wall constraints can be negligible. For tridimensional flow, the following parameters are investigated: test section height/width ratio, model span test section width ratio, wing sweep and horizontal wall porosity; this porosity is assumed to be uniform and the same for floor and ceiling. The model schematization rules, necessary and sufficient to calculate the lift interference coefficients, are given. Author

N77-11979# National Aerospace Lab., Amsterdam (Netherlands).
WIND TUNNEL TESTS AND AERODYNAMIC COMPUTATIONS; THOUGHTS ON THEIR USE IN AERODYNAMIC DESIGN **c05**
J. W. Slooff *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 6 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

After comparing the possibilities and limitations of numerical methods and wind tunnel tests, their respective roles in aerodynamic design are discussed. It is concluded that the key problems of aerodynamic design are not solved by substituting numerical methods for the wind tunnel. Author

N77-11980# National Aeronautical Establishment, Ottawa (Ontario).
APPLICATION OF COMPUTED SHOCK STANDOFF DISTANCES FOR WINDTUNNEL CALIBRATION AT SUPERSONIC MACH NUMBERS LESS THAN 1.2 **c02**
D. J. Jones *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 5 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Calibration of a wind tunnel in the Mach number range $1 < M < 1.1$ was carried out by taking Schlieren photos of the bow shock in front of a sphere. A theory was developed to

calculate this bow shock for flows about axisymmetric bodies. By correlating the experimental and theoretical shock waves, the wind tunnel was calibrated. Author

N77-11981# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
THEORETICAL AND EXPERIMENTAL SIMULATION METHODS FOR EXTERNAL STORE SEPARATION TRAJECTORIES **c09**
J. VonDerDecken, P. Esch, and P. Fritz *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 5 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Numerical methods and experimental techniques for the simulation of separation trajectories of external powered and unpowered stores at low and high speed are reviewed. For the theoretical simulation, potential flow methods are used to calculate the quasi-steady loadings on the store while the trajectory itself is determined by solving the equations of the 6-degree-of-freedom motion. Based on the experience of numerous systematic experimental studies gained with the rigid loads and the freedrop technique for unpowered stores, the advantages and limitations of different wind tunnel techniques are demonstrated including a critical discussion of scaling effects. Author

N77-11982*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTS PLANNED SPECIFICALLY FOR DEVELOPING TURBULENCE MODELS IN COMPUTATIONS OF FLOW FIELDS AROUND AERODYNAMIC SHAPES **c02**
Joseph G. Marvin *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 13 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01 CSCL 01A

Building block experiments and companion numerical simulations intended to verify and guide turbulence modeling are described. A series of experiments and computations being used to enhance modeling development for the shock wave turbulent boundary layer interaction problem is emphasized. Results are given for transonic flow over a circular arc airfoil undergoing shock wave induced, boundary layer separation for supersonic flow along a tube wall undergoing normal shock wave induced, boundary layer separation. Experimental data which use the complete Navier-Stokes equations are discussed. Author

N77-11983# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE IMPORTANCE OF EXPERIMENTALLY-DETERMINED CLOSURE CONDITIONS IN TRANSONIC BLADE-TO-BLADE FLOWS CALCULATED BY A TIME-DEPENDENT TECHNIQUE **c02**
M. Couston *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 23 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

The use of a time dependent technique to determine inviscid blade-to-blade flow in the transonic regime for axial turbomachines is faced with the problem of closure conditions. The importance of a Kutta condition in subsonic flow calculations is well known but for transonic blades the problem is still more complex. The quasi-discontinuous character of the flow through shock waves and Prandtl-Meyer expansions is then superimposed on the viscous effects which dominate near the trailing edge. In order to get more information about the importance of this problem, a comparison between detailed measurements and calculations is presented. The calculations were performed for several trailing edge flow approximations including experimentally determined conditions. Author

N77-11984# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
NUMERICAL SIMULATION OF THREE DIMENSIONAL TRANSONIC FLOW INCLUDING WIND TUNNEL WALL EFFECTS **c09**
W. Schmidt, H.-W. Stock, and W. Fritz *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 8 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Numerical methods and their practical implementation are presented to compute steady transonic flow fields about wings and wing-body combinations in transonic flow including viscous effects as well as wind tunnel wall effects. The transonic small disturbance potential equation is solved by a mixed finite difference scheme. Wind tunnel wall boundary conditions are incorporated in the relaxation procedure by use of the classical wall condition equations. The three dimensional boundary layer equation is solved by an integral prediction method. Solving potential equation and boundary layer equation iteratively, viscous effects are accounted for by means of the displacement thickness concept. Results showing the influence of Reynolds number and Mach number on pressure distribution and shock position are shown. Author

N77-11985# Laboratoire d'Aerothermique du C.N.R.S., Meudon (France).
FOURIER ANALYSIS AND THE CORRELATION OF SPEED WITH NONSTATIONARY AERODYNAMICS [ANALYSE DE FOURIER ET CORRELATION DE VITESSE EN AERODYNAMIQUE INSTATIONNAIRE] **c02**
Pierre Gougat and Francoise Martin *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 7 p refs In FRENCH (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

Transition from a laminar to a turbulent state begins with the appearance of natural instabilities made up of sine waves of uncertain intermittance in the midst of the boundary layer. The response of the boundary layer to a local vibration in the wall is studied in order to suppress the uncertain character of the intermittance. The sine wave of deformation of the wall is obtained with the aid of a lock-on displacement loop. The signal of speed fluctuations in the boundary layer is obtained with a hot wire anemometer. These two data are treated separately by real time analysis which permits measuring the harmonic rate of the signal of deformation to determine the spectral density of the power of the fluctuations of speed. The simultaneous treatment of two signals is used for real time correlation. To this correlation is associated a Fourier transformation which provides the mutual spectrum of the two signals. A magnetic recording stores the signals and reads them again at a speed which facilitates the observations and study of the instantaneous phenomena. Transl. by A.H.

N77-11986# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
PICKING UP AND GRAPHING OF THREE DIMENSIONAL FLOW FIELDS **c02**
H.-J. Graefe *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 12 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

An efficient test technique is described for three dimensional flow field measurements which was set up in combination with a conventional measurement technique with modern electronical equipment. The test rig is installed in the low speed wind tunnel. Some suggestions for graphic representations of three dimensional flow fields are given. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N77-11987 Pittsburgh Univ., Pa.
EXPERIMENTAL AND THEORETICAL ANALYSIS OF TRANSONIC FLOW AROUND A SPHERE Ph.D. Thesis
Kadambi Jaikrishnan 1976 176 p
Avail: Univ. Microfilms Order No. 76-21790

Experiments were conducted on three different size spheres in air. The free stream Mach number was varied from 0.58 to 0.97. The Reynolds number and the stem blockage effects were observed. A mathematical model was developed based upon a variational method. A variational principle for the mixed,

irrotational and rotational, inviscid steady flow was formulated. Solution schemes using Galerkin-Kantorovich Method and orthogonal collocation were developed for solving the Euler-Lagrange equations obtained from minimizing the variational integral. A numerical solution was obtained for the Euler-Lagrange equations using the orthogonal collocation method. A comparison was made between the experimentally obtained and theoretically determined pressure distribution on the surface of the sphere. The agreement between the two results was excellent.
Dissert. Abstr.

N77-11988 British Library Lending Div., Boston Spa (England).
FLOW-INDUCED VIBRATIONS RESULTING FROM KARMAN VORTEX TRAILS
Y. N. Chen 25 Mar. 1976 16 p refs Transl. into ENGLISH from Energietechnik (Leipzig), v. 25, no. 5, May 1975 p 200-205 Presented at 6th Power Station Technol. Colloq., Dresden, East Germany, 24-25 Sep. 1974
(BLL-Risley-TR-2994-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Karman eddy streets are formed on flow around structural elements of a power station and individual cylinders, tube bundles, plates, which induce periodic dynamic forces transverse to the flow at these elements. The Karman eddy street beyond a plate exposed to longitudinal flow depends largely on the outlet edge shape of the plate. If the plate has a very slender outlet edge, then the frequency of the Karman eddy is determined by the Tollmien-Schlichting instability wave in the separated boundary layer. If however, the outlet edge is not of slender shape, so that a thick flow run-on forms beyond the plate, then the eddy frequency is determined by the thickness and configuration of the outlet edge. Author

N77-11989*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VORTEX SIMULATION OF THE PRESSURE FIELD OF A JET
Y. T. Fung and C. H. Liu Nov. 1976 29 p refs Presented at 92d ASA Meeting, San Diego, Nov. 1976
(NASA-TM-X-73984) Avail: NTIS HC A03/MF A01 CSCL 01A

Fluctuations of the pressure field of a jet are simulated numerically by a flow model consisting of axisymmetric vortex rings with viscous cores submerged in an inviscid uniform stream. Vortex shedding time intervals, randomly created to imitate the time-history characteristics of the pressure signals of a jet, are generated based on a probability distribution of the intervals between successive pressure peaks obtained from experiments. It is found that, up to five diameters downstream of the jet exit, the characteristics of the pressure fluctuations and the most proable time intervals between experimental and numerical results show good qualitative agreements. The role played by the axisymmetric vortex model in pressure field as well as extensions of the model is also discussed. Author

N77-11990*# Scientific Translation Service, Santa Barbara, Calif.
THE EFFECT OF VARIOUS AIR DENSITY-ALTITUDE RELATIONS ON THE PHUGOID Ph.D. Thesis
Otto Wagner Washington NASA Aug. 1976 288 p refs Transl. into ENGLISH from the book "Der Einfluss Verschiedener Luftdichte-Hoehe-Verlaeufe auf die Phygoide" Munich, Techn. Univ., 1975 231 p
(Contract NASw-2791)
(NASA-TT-F-17118) Avail: NTIS HC A13/MF A01 CSCL 01A

The large scale longitudinal motion of a flying object is considered. A mathematical representation is obtained of the three variables of motion for a solution of the nonlinear longitudinal differential equation system. The solution is discussed. Attention is given to a mathematical model for the uncoupled longitudinal motion of a flying object and the basic cases of thrust controlled longitudinal motion of the object. The nondamped phugoid motions of flight vehicles are studied for three atmospheric models.
Author

N77-11991*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INLET TOTAL PRESSURE LOSS DUE TO ACOUSTIC WALL TREATMENT
Brent A. Miller [1977] 16 p refs Proposed for presentation at 15th Aerospace Sci. Meeting, Los Angeles, 24-26 Jan. 1977; sponsored by AIAA
(NASA-TM-X-73559; E-8946) Avail: NTIS HC A02/MF A01 CSCL 01A

The effect of diffuser wall acoustic treatment on inlet total pressure loss was experimentally determined. Data were obtained by testing an inlet model with 10 different acoustically treated diffusers differing only in the design of the Helmholtz resonator acoustic treatment. Tests were conducted in a wind tunnel at forward velocities to 41 meters per second for inlet throat Mach numbers of .5 to .8 and angles of attack as high as 50 degrees. Results indicate a pressure loss penalty due to acoustic treatment that increases linearly with the porosity of the acoustic facing sheet. For a surface porosity of 14 percent the total pressure loss was 21 percent greater than that for an untreated inlet.
Author

N77-11992*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A METHOD FOR THE ANALYSIS OF NONLINEARITIES IN AIRCRAFT DYNAMIC RESPONSE TO ATMOSPHERIC TURBULENCE
Kenneth Sidwell Washington Nov. 1976 83 p refs
(NASA-TN-D-8265; L-10487) Avail: NTIS HC A05/MF A01 CSCL 01C

An analytical method is developed which combines the equivalent linearization technique for the analysis of the response of nonlinear dynamic systems with the amplitude modulated random process (Press model) for atmospheric turbulence. The method is initially applied to a bilinear spring system. The analysis of the response shows good agreement with exact results obtained by the Fokker-Planck equation. The method is then applied to an example of control-surface displacement limiting in an aircraft with a pitch-hold autopilot. Author

N77-11993*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC DESIGN GUIDELINES AND COMPUTER PROGRAM FOR ESTIMATION OF SUBSONIC WIND TUNNEL PERFORMANCE
William T. Eckert, Kenneth W. Mort, and Jean Jope Washington Oct. 1976 196 p refs Prepared in cooperation with Army Air Mobility R and D Lab, Moffett Field, Calif.
(NASA-TN-D-8243; A-5944) Avail: NTIS HC A09/MF A01 CSCL 14B

General guidelines are given for the design of diffusers, contractions, corners, and the inlets and exits of non-return tunnels. A system of equations, reflecting the current technology, has been compiled and assembled into a computer program (a user's manual for this program is included) for determining the total pressure losses. The formulation presented is applicable to compressible flow through most closed- or open-throat, single-, double-, or non-return wind tunnels. A comparison of estimated performance with that actually achieved by several existing facilities produced generally good agreement. Author

N77-11994*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SCRAMJET NOZZLE DESIGN AND ANALYSIS AS APPLIED TO A HIGHLY INTEGRATED HYPERSONIC RESEARCH AIRPLANE
William J. Small, John P. Weidner, and P. J. Johnston Washington Nov. 1976 46 p refs
(NASA-TN-D-8334; L-11003) Avail: NTIS HC A03/MF A01 CSCL 01C

Engine-nozzle airframe integration at hypersonic speeds was conducted by using a high-speed research aircraft concept as a focus. Recently developed techniques for analysis of scramjet-nozzle exhaust flows provide a realistic analysis of complex forces resulting from the engine-nozzle airframe coupling. By properly integrating the engine-nozzle propulsive system with the airframe, efficient, controlled and stable flight results over a wide speed range. Author

N77-11995*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

WIND TUNNEL INVESTIGATION OF INTERNALLY BLOWN JET-FLAP STOL AIRPLANE MODEL

Raymond D. Vogler Washington Nov. 1976 87 p
(NASA-TN-D-8309; L-10887) Avail: NTIS HC A05/MF A01 CSCL 01C

The low speed longitudinal characteristics of the jet flap STOL model were determined. The 17 percent thick supercritical swept wing had leading edge slats and a full span 0.30 chord plain flap with flaperons divided into six equal spanwise segments. The angle of attack range was -4 deg to 24 deg, and the blowing momentum range was from 0 to 2.3. Flap deflections were from 0 deg to 70 deg. Most flap deflections were full span although there were some tests of partial span deflections and partial span blowing. Author

N77-11996*# Tennessee Univ. Space Inst., Tullahoma.

ATMOSPHERIC FLOW OVER TWO-DIMENSIONAL BLUFF SURFACE OBSTRUCTIONS

Juergen Bitte and Walter Frost Washington NASA Oct. 1976 225 p refs
(Contract NAS8-29584)
(NASA-CR-2750; M-182) Avail: NTIS HC A10/MF A01 CSCL 20D

The phenomenon of atmospheric flow over a two-dimensional surface obstruction, such as a building (modeled as a rectangular block, a fence or a forward-facing step), is analyzed by three methods: (1) an inviscid free streamline approach, (2) a turbulent boundary layer approach using an eddy viscosity turbulence model and a horizontal pressure gradient determined by the inviscid model, and (3) an approach using the full Navier-Stokes equations with three turbulence models; i.e., an eddy viscosity model, a turbulence kinetic-energy model and a two-equation model with an additional transport equation for the turbulence length scale. A comparison of the performance of the different turbulence models is given, indicating that only the two-equation model adequately accounts for the convective character of turbulence. Turbulence flow property predictions obtained from the turbulence kinetic-energy model with prescribed length scale are only insignificantly better than those obtained from the eddy viscosity model. A parametric study includes the effects of the variation of the characteristics parameters of the assumed logarithmic approach velocity profile. For the case of the forward-facing step, it is shown that in the downstream flow region an increase of the surface roughness gives rise to higher turbulence levels in the shear layer originating from the step corner. Author

N77-11997*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LOW-SPEED WIND-TUNNEL INVESTIGATION OF A LARGE SCALE ADVANCED ARROW-WING SUPERSONIC TRANSPORT CONFIGURATION WITH ENGINES MOUNTED ABOVE WING FOR UPPER-SURFACE BLOWING

James P. Shivers, H. Clyde McLemore, and Paul L. Coe, Jr. Washington Dec. 1976 61 p refs
(NASA-TN-D-8350; L-10994) Avail: NTIS HC A04/MF A01 CSCL 01A

Tests have been conducted in a full scale tunnel to determine the low speed aerodynamic characteristics of a large scale advanced arrow wing supersonic transport configuration with engines mounted above the wing for upper surface blowing. Tests were made over an angle of attack range of -10 deg to 32 deg, sideslip angles of + or - 5 deg, and a Reynolds number range of 3,530,000 to 7,330,000. Configuration variables included trailing edge flap deflection, engine jet nozzle angle, engine thrust coefficient, engine out operation, and asymmetrical trailing edge boundary layer control for providing roll trim. Downwash measurements at the tail were obtained for different thrust coefficients, tail heights, and at two fuselage stations. Author

N77-11998*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

INVESTIGATION OF VERY LOW BLOCKAGE RATIO BOATTAIL MODELS IN THE LANGLEY 16-FOOT TRANSONIC TUNNEL

David E. Reubush Washington Nov. 1976 65 p refs
(NASA-TN-D-8335; L-11063) Avail: NTIS HC A04/MF A01 CSCL 01A

An investigation at an angle of attack of 0 deg was conducted in a 16 foot transonic tunnel at Mach numbers from 0.4 to 1.05 to determine the limits in Mach number at which valid boattail pressure drag data may be obtained with very low blockage ratio bodies. Extreme care was exercised when examining any data taken at subsonic Mach numbers very near 1.0 and lower than the supersonic Mach number at which shock reflections miss the model. Boattail pressure coefficient distributions did not indicate any error, but when integrated boattail pressure drag data was plotted as a function of Mach number, data which were in error were identified. Author

N77-11999*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CORRELATION OF FULL-SCALE HELICOPTER ROTOR PERFORMANCE IN AIR WITH MODEL-SCALE FREON DATA

William T. Yeager, Jr. and Wayne R. Mantay Washington Dec. 1976 60 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Hampton, Va.
(DA Proj. 1F1-61102-AH-45)
(NASA-TN-D-8323; L-10844) Avail: NTIS HC A04/MF A01 CSCL 01A

An investigation was conducted in a transonic dynamics tunnel to measure the performance of a 1/5 scale model helicopter rotor in a Freon atmosphere. Comparisons were made between these data and full scale data obtained in air. Both the model and full scale tests were conducted at advance ratios between 0.30 and 0.40 and advancing tip Mach numbers between 0.79 and 0.95. Results show that correlation of model scale rotor performance data obtained in Freon with full scale rotor performance data in air is good with regard to data trends. Mach number effects were found to be essentially the same for the model rotor performance data obtained in Freon and the full scale rotor performance data obtained in air. It was determined that Reynolds number effects may be of the same magnitude or smaller than rotor solidity effects or blade elastic modeling in rotor aerodynamic performance testing. Author

N77-12000*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COLD-AIR PERFORMANCE OF A TIP TURBINE DESIGNED TO DRIVE A LIFT FAN. 1: BASELINE PERFORMANCE

Jeffrey E. Haas, Milton G. Kofskey, Glen M. Hotz, and Samuel M. Futral, Jr. Washington Dec. 1976 25 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-3452; E-8754) Avail: NTIS HC A02/MF A01 CSCL 21E

Full admission baseline performance was obtained for a 0.4 linear scale of the LF460 lift fan turbine over a range of speeds and pressure ratios without leakage air. These cold-air tests covered a range of speeds from 40 to 140 percent of design equivalent speed and a range of scroll inlet to diffuser exit static pressure ratios from 2.0 to 4.2. Results are presented in terms of specific work, torque, mass flow, efficiency, and total pressure drop. Author

N77-12001# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service Aerodynamique.

SUPERSONIC AIRCRAFT AFTER BODY STUDY OF A THICK BOUNDARY LAYER ON A TWO-DIMENSIONAL STEP [ARRIERE CORPS D'AVIONS SUPERSONIQUES. ETUDE D'UNE COUCHE LIMITE EPAISSE SUR UNE MARCHE BIDIMENSIONNELLE]

F. Kauba 17 May 1976 83 p refs In FRENCH
(Contract DRME-74-118)
(LRBA-E-815-PV-4/SAE) Avail: NTIS HC A05/MF A01

Separation and reattachment of a thick boundary layer on a two-dimensional step was studied in a supersonic wind tunnel. The ratio flow thickness (delta)/step height (h = 5 mm) was 2. The bi-dimensionality of the flow on the plane part of the step after flow reattachment was confirmed and the validity of certain results obtained for values delta/h smaller than or equal to 1 was checked. Attempts to sound the recirculation zone are also described. ESA

N77-12002# European Space Agency, Paris (France).

EFFECT OF SPECIFIC CONFIGURATION CHANGES ON THE AERODYNAMICS OF THE MSC-040-A ORBITER AT

TRANSONIC SPEEDS

Egon Stanewsky, Gaston Netter et al Oct. 1976 98 p refs Transl. into ENGLISH of 'Einfluss spezifischer Konfigurationsaenderungen auf die Aerodyn. des MSC-040-A-Orbiters im transsonischen Geschwindigkeitsbereich', DFVLR, Goettingen, West Ger. Report DLR-FB-75-18, 9 Jan. 1975 Original report in GERMAN previously announced as N76-31203 Original German report available from DFVLR, Porz, West Ger. DM 51.60
(ESA-TT-332; DLR-FB-75-18) Avail: NTIS HC A05/MF A01

The effect of specific configuration changes on the longitudinal and lateral-directional characteristics of the space shuttle orbiter was investigated. Essential configuration changes included the design of the vertical tail, a wider forward fuselage and the aerodynamic shaping of the wing ACPS pods. Results of this investigation are summarized. In addition, the effect of Reynolds number and transition on the flow development on the orbiter is shown. Author (ESA)

N77-12003# European Space Agency, Paris (France).

DISPLAY AND CALCULATION OF FLOW PAST WINGS IN SUPERSONIC FLIGHT

Erich Leiter Oct. 1976 126 p refs Transl. into ENGLISH of 'Stroemungen um Tragflaechen im stationaeren Ueberschallflug. Ihre Darstellung u. Berechnung auf der Grundlage von Auftriebs-Aufwindbeziehungen', DFVLR, Goettingen, West Ger. Report DLR-FB-75-61, 26 Aug. 1975 Original report in GERMAN previously announced as N76-31204 Original German report available from DFVLR, Cologne DM 57.50
(ESA-TT-333; DLR-FB-75-61) Avail: NTIS HC A07/MF A01

A linearized wing theory was derived from a general relation between lift and down/upwash-distribution. This equation was obtained as a solution of an initial value problem of Hadamrad's integration theory. The known results are deduced. Analytical approximations are given for the upwash-distribution. In the case of wings with two subsonic leading edges, successive approximations and estimations of errors are made available. A new subsonic-supersonic analogy is pointed out. Author (ESA)

N77-12004# European Space Agency, Paris (France).

ON THE SIMULATION OF AN UNDEREXPANDED PROPULSIVE JET FOR THE INVESTIGATION OF THE STATIC LONGITUDINAL STABILITY OF AN AXIALLY SYMMETRIC FLIGHT VEHICLE IN SUPERSONIC FLOW

Hans Emunds et al Oct. 1976 61 p refs Transl. into ENGLISH of 'Zur Simulation eines unterexpandierten Treibstrahls bei der Untersuch. der statischen Laengsstabilitaet eines achsensymmetrischen Flugkoerpers in einer Ueberschallstroemung', DFVLR, Cologne Report DLR-FB-76-21, 15 Mar. 1976 Original report in GERMAN previously announced as N76-27183 Original German report available from DFVLR, Cologne DM 25.70
(ESA-TT-334; DLR-FB-76-21) Avail: NTIS HC A04/MF A01

Tests were carried out in the 30 x 30 sq cm supersonic wind tunnel of the DFVLR in Porz-Wahn with the aim of verifying the determination whether or not, for wind tunnel investigations concerning the determination of the effect of an underexpanded propulsive jet on the static longitudinal stability of an axisymmetric flight vehicle in supersonic flow, the jet plume of the propulsive jet can be replaced by a corresponding solid body. Cold air was used as medium for the direct simulation of the propulsive jet. It was found that for accurate investigations of this kind a solid body jet simulation is justified provided the influence of the surrounding flow on the contour of the jet plume of the cold air jet is taken into account in designing the solid body jet simulator. Author (ESA)

N77-12005# European Space Agency, Paris (France).

AERODYNAMIC COEFFICIENTS AND POSITION OF THE BOW SHOCK WAVE OF CIRCULAR CONES WITH POINTED AND SPHERICALLY BLUNTED NOSES IN SUPERSONIC FLOW

Hans Emunds Oct. 1976 219 p refs Transl. into ENGLISH of "Aerodyn. Beiwerte u. Lage der Bugstosswelle fuer Kreiskegel mit spitzer u. kugelfoermig abgerundeter Nase im Ueberschall", DFVLR, Cologne Report DLR-FB-76-26, 2 Apr. 1976 Original report in GERMAN previously announced as N76-33151 Original German report available from DFVLR, Cologne DM 76.20
(ESA-TT-335; DLR-FB-76-26) Avail: NTIS HC A10/MF A01

The aerodynamic coefficients were determined in the 30 x 30 sq cm supersonic wind tunnel of the DFVLR, Porz-Wahn, by force and pressure measurements for the Mach number range 1.57 < or = free stream Mach < or = 4.15 and for angles of attack from -3 to 5 deg. The cone semi-apex angle was varied between 5 and 90 deg, and the Reynolds number base diameter covered a range of 3.02 x 1 million < or = Re < or = 5.11 x 1 million. At zero incidence the position of the bow shock wave was determined from schlieren and shadow photographs. Author (ESA)

N77-12006# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Aeroballistics Directorate.

INVESTIGATION OF JET PLUME EFFECTS ON THE LONGITUDINAL STABILITY CHARACTERISTICS OF A BODY OF REVOLUTION WITH VARIOUS FIN CONFIGURATIONS AT MACH NUMBERS FROM 0.2 TO 2.3 (NORMAL JET PLUME SIMULATOR)

James H. Henderson 20 Feb. 1976 95 p refs
(DA Proj. 1W3-62303-A-214)
(AD-A024978; RD-76-22) Avail: NTIS HC A05/MF A01 CSCL 20/4

Transonic wind tunnel tests were conducted on a body of revolution with various fin configurations to investigate jet plume effects on missile longitudinal stability. A series of cold air normal jets located downstream of the base were utilized to simulate the jet plume. Fins of various planform geometry were tested at a forward longitudinal location. The angle of attack range was -4 to 11 degrees at Mach numbers of from 0.2 to 2.3. The test was run at the Arnold Engineering Development Center Transonic 16t and Supersonic 16S wind tunnels and was designated AEDC SF 172/TF 360. GRA

N77-12007# Strategic Air Command, Offutt AFB, Nebr. Office of Science and Research.

SUMMARY AND EVALUATION OF THEORETICAL DEVELOPMENTS RELATING TO TRAILING WING TIP VORTICES GENERATED BY AIRCRAFT

Albert G. Carpenter 10 May 1976 50 p refs
(AD-A025614; SAC-NR-76-01) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report presents a summary of theories and measurements which are believed to be applicable to the prediction of details concerning the structure and behavior of wing tip vortices created by large aircraft. Emphasis is placed upon the chronological development of theories, their comparison, and the selection of those which are believed to be most useful in predicting detailed velocity profiles of and within vortices from the moment of wing tip shedding until considerable trailing distances have been established with the passage of time. Author (GRA)

N77-12008# California Univ., Los Angeles. School of Engineering and Applied Science.

RESULTS OF SOME INVESTIGATIONS OF DIFFERENTIAL GAIN THEORY APPLIED TO AIR-TO-AIR SYSTEMS. VOLUME 2: STOCHASTIC DIFFERENTIAL GAMES WITH COMPLEXITY CONSTRAINED STRATEGIES FOR AIR-TO-AIR SYSTEMS Final Report, Mar. 1974 - Apr. 1975

Donald McDonald Stuart, Jr. Wright-Patterson AFB, Ohio AFFDL Aug. 1975 124 p refs
(Contract F33615-74-C-3072; AF Proj. 1929)
(AD-A025322; AFFDL-TR-75-76-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 16/2

An examination is made of some problems encountered in the optimal control of a linear dynamic system by two independent controllers with noisy state observations, the controllers having either conflicting or concurring objectives. The question of what form the optimal controls should take is also discussed. By restricting consideration to linear forms, it is shown that the computational complexity of a general optimal linear strategy is considerable. Attention is further restricted to a particular linear form for the optimal controls; a matrix transformation of a vector which is the solution of a linear differential equation forced by the observations. Properties of certain forms of this type of control are analyzed, and it is shown that the parameters of these forms may be expressed in terms of solutions to a set of nonlinear differential equations with split boundary conditions. It is also demonstrated that these forms reduce, in a one-input case, to

those specified by the separation principle of one-sided optimal control. Author (GRA)

N77-12009# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL INVESTIGATION OF THE WHISTLER NOZZLE AND AN ANALYTICAL INVESTIGATION OF A RING WING IN SUPERSONIC FLOW M.S. Thesis
Donald L. Weiss Mar. 1976 96 p refs
(AD-A025672) Avail: NTIS HC A05/MF A01 CSCL 01/3

This thesis consists of two parts. First, an experimental investigation of a new device called the Whistler nozzle was conducted. Experiments were conducted in the areas of nozzle efficiency, mass entrainment, and flow visualization. Flow visualization showed the presence of a Coanda type jet wall interaction in the nozzle collar. Thrust efficiencies indicated that whistling could be achieved without much greater losses than the basic axisymmetric jet. Entrainment tests were inconclusive regarding the Whistler nozzle performance. Second, supersonic flow past an oscillating cylindrical shell is analyzed using linearized characteristics methods. Pressure distributions and generalized aerodynamic forces are calculated and presented for various radius to length ratios and reduced frequencies. Good agreement is obtained in the two dimensional limiting case with previous work by Platzer, and an early solution of the steady cylindrical case by Zierep. Author (GRA)

N77-12010# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
VELOCITY MEASUREMENTS ON THE AERODYNAMIC WAKE OF A HOVERCRAFT USING LASER DOPPLER ANEMOMETRY
W. E. R. Davies and J. H. DeLeeuw Jun. 1976 26 p refs
(Grant AF-AFOSR-2091-71)
(UTIAS-TN-203; CN-ISSN-0082-5263) Avail: NTIS HC A03/MF A01

The laser Doppler technique was applied to determine the aerodynamic wake velocity components behind a tethered air cushion vehicle which runs close to a confining wall. Two velocity components were measured for a number of locations behind the vehicle, using the fringe mode and forward scattering from unseeded air. Some auxiliary forward and back scatter experiments with pulsed and D.C. lasers are also described. A video tape recorder was used to record all the laser Doppler data, which could then be processed by an oscilloscope, a spectrum analyser of a DISA 55L signal processor. Results are presented which show that the stabilized wake effects are minimal. Author

N77-12011# Stevens Inst. of Tech., Hoboken, N.J. Davidson Lab.
WAVES GENERATED BY A UNIFORMLY MOVING OSCILLATORY SURFACE EFFECT SHIP Final Letter Report, Nov. 1974 - Jan. 1976
C. H. Kim and S. Tsakonas Mar. 1976 50 p refs
(Contract N00014-75-C-0448; SR0230101)
(AD-A025129; SIT-DL-76-1874) Avail: NTIS HC A03/MF A01 CSCL 20/4

An air-cushion supported vehicle and the surface effect ship-type operating on the interface of two media (air and water) is a multi-parameter system influenced by the hydrodynamics of the fluid medium as well as by the aerodynamics of the air chamber which is under continuous supply of air through a system of fans and exhaust (leakage) through the peripheral gap. The study concerns the hydrodynamic aspect of the problem where the presence of the vehicle is simulated by a pressure patch of oscillatory nature and constant amplitude moving uniformly at the free surface of a three-dimensional space. The approach is very general, applicable to arbitrary Froude numbers and reduced frequencies and can be extended to the case of a spatially variable pressure patch. GRA

N77-12012# Aeronautical Research Associates of Princeton, Inc., N.J.
USER'S MANUAL: SUPERSONIC UNSTEADY CASCADE PROGRAM, VOLUME 2 Final Report, 22 Apr. - 22 Dec. 1975
John E. Yates Dec. 1975 39 p refs
(Contract F33615-75-C-3102; AF Proj. 1370)
(AD-A025186; ARAP-262-Vol-2; AFFDL-TR-75-159-Vol-2)
Avail: NTIS HC A03/MF A01 CSCL 20/4

This report is a users manual for a linearized unsteady supersonic cascade program. The basic theory is summarized in Section II together with a brief description of the numerical algorithm. A detailed description of how to use the program is given in Section III. The program can be used to calculate unsteady lift and moment coefficients on a supersonic finite two-dimensional cascade in a wind tunnel or free stream. Individual blades are excited in translation or rotation and the lift and moment coefficients are calculated on all other blades. An optional modified Kutta condition is included in the program. The detailed underlying theory is included in a companion technical report ('Analysis of Supersonic Unsteady Cascades with the Method of Characteristics,' AFFDL-TR-159, Volume I, December 1975). Author (GRA)

N77-12013# Advisory Group for Aerospace Research and Development, Paris (France).
THROUGH-FLOW CALCULATIONS IN AXIAL TURBOMACHINERY
Oct. 1976 237 p refs Proceedings held at Cologne, West Germany, 20-21 May 1976
(AGARD-CP-195; ISBN-92-835-0179-9) Avail: NTIS HC A11/MF A01

An axisymmetric approach is used in considering flow distributions at design and off-design conditions in single and multi-stage turbomachines. For individual titles, see N77-12014 through N77-12026.

N77-12014# Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Villaroche (France).
MODELS FOR CALCULATING FLOW IN AXIAL TURBOMACHINERY [MODELES DE CALCUL DE L'ECOULEMENT DANS LES TURBOMACHINES AXIALS]
Jean-Marine Thiaville *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 16 p refs In FRENCH (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

The problem of calculating axial flow in turbomachines is approached using the model of current surfaces S1 and S2 of C. H. Wu. Viscous effects are introduced under the form of loss and the effects of displacement. The boundary layer theory is accepted. The simplified model is used to analyze the connection of the estimates of surfaces S1 and S2. Transonic flow is studied. Diagrams of loss and of angles beyond adaptation are provided. Blocking and secondary flow are considered. Applications in which the model is defective are discussed and methods for resolving the difficulties are suggested. Transl. by A.H.

N77-12015# Durham Univ. (England). Dept. of Engineering Science.
THROUGH-FLOW CALCULATIONS IN AXIAL TURBOMACHINERY: A TECHNICAL POINT OF VIEW
H. Marsh *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 19 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

The through-flow theory for turbomachines and a detailed discussion on the methods of streamline curvature and matrix through-flow are reported. These two methods of solution are shown to be two different techniques for calculating the flow on a mean stream surface. The Mach number limitations are outlined and the lack of a rigorous definition for the mean stream surface is discussed. The use of a consistent loss model leads to an improved form of the matrix method. Recent advances in the calculation of wall boundary layers and secondary flows are reported. Work on time marching techniques is reviewed. Author

N77-12016# Carleton Univ., Ottawa (Ontario).
THROUGH-FLOW CALCULATIONS BASED ON MATRIX INVERSION: LOSS PREDICTION
W. Roland Davis (Davis and Associates, Ottawa) and D. A. J. Millar *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 12 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

The inviscid flow field in the meridional (hub-to-shroud) plane of an axial compressor is solved by a finite difference technique

which employs matrix inversion. The viscous flow effects are accounted for by using empirical data, and the performance of the compressor is determined by an interactive solution. This describes the loss and deflection system which is used to model the effects of blade passage and end wall losses, and of blade passage deflection of the working fluid. The manner in which this system interacts with the matrix inviscid solution is described. Author

N77-12017# Detroit Diesel Allison, Indianapolis, Ind.
THROUGH-FLOW CALCULATIONS: THEORY AND PRACTICE IN TURBOMACHINERY DESIGN
John E. Caruthers and Theodore F. McKain *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 14 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

The through-flow calculation is an integral and vital element of any effective turbomachinery design and development process. The assumptions involved with typical formulation of the basic equations and the solution techniques employed in such areas as boundary condition specification, numerical evaluation of derivatives and numerical stability are presented. Experimental verification of the theory, using turbomachinery applications, is presented to demonstrate the accuracy of the calculation. Finally, the normal compressor design and development cycle is reviewed to stress the importance of the through-flow calculation in this process. Author

N77-12018# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.
FINITE ELEMENT METHOD FOR THROUGH-FLOW CALCULATIONS
Ch. Hirsch *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 16 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

The finite element method is applied to the radial equilibrium equation in the form obtained after introduction of the stream function. A short presentation of the basic features of the F.E.M. is given and the particular aspects of its application to the through-flow problem in turbomachines are described. A comparison with an analytic solution for an axisymmetric transitional annulus with swirl allows an estimation of the numerical accuracy of the method. Other examples of results include a transonic axial compressor and an axial turbine. The coupling with an end-wall boundary layer calculation for axial compressors is also briefly described. Author

N77-12019*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
THREE-DIMENSIONAL FLOW CALCULATION FOR A TRANSONIC COMPRESSOR ROTOR
William T. Thompkins, Jr. and David A. Oliver *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 18 p refs (For primary document see N77-12013 03-02)
(Grant NGL-22-009-383)
Avail: NTIS HC A11/MF A01

A numerical calculation of the steady, inviscid, three dimensional flow in a isolated transonic compressor rotor has been completed using MacCormack's second order accurate time-marching scheme. This rotor has a tip Mach number of 1.2, an overall diameter of 2 feet, and inlet hub/tip ratio of 0.5. The computed rotor total pressure ratio is 1.82. Comparisons between the numerical solution, measurements of the intra-blade static density field obtained by gas fluorescence, and time resolved exit flow measurements showed that the inviscid computation accurately models transonic rotor aerodynamics and rotor blade pressure distributions in the upstream portions of the blade passages, the viscous effects influencing mainly the downstream flow. Author

N77-12020# GEC Turbine Generators Ltd., Manchester (England). Theoretical Aerodynamics Group.
THROUGH-FLOW CALCULATION PROCEDURES FOR APPLICATION TO HIGH SPEED LARGE TURBINES
H. J. A. Cox *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 13 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

Major difficulties arise in the evaluation of through-flow solutions relevant to conditions existing within the rear stages of large modern low pressure steam turbines. The highly loaded stage designs in which convergent-divergent profiles are used require computation procedures which can accurately allow for supersonic Mach numbers at both guide and runner blade outlet, high values of streamline slope in the meridional plane and varying quantities of mass flow tapped off between stages. The consequent effect of these conditions on turbine performance and various methods by which they can be incorporated into a streamline curvature computation process are discussed together with the use of steam thermodynamic data. Procedures which can be employed to obtain numerical stability and convergence in the computation process are suggested and further problems concerned with the evaluation of off-design solutions are briefly considered. Author

N77-12021# Brown, Boveri and Co., Ltd., Baden (Switzerland). Dept. of Gas Turbines.
DESIGN OF TURBINE, USING DISTRIBUTED OR AVERAGE LOSSES; EFFECT OF BLOWING
D. K. Mukherjee *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 14 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

The design of a multi-stage turbine begins with one dimensional calculations. Flow field computations which then follow are invaluable as they allow to determine velocity triangles at different radii and to design the blades. In these calculations, aerodynamic losses and outlet angle deviations due to secondary and tip clearance flow, as well as the influence of coolant on the main stream expansion are taken into account. Author

N77-12022# Northern Research and Engineering Corp., Cambridge, Mass. Fluid Dynamic Systems Group
A CRITICAL REVIEW OF TURBINE FLOW CALCULATION PROCEDURES
A. F. Carter *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 7 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

Blade row performance parameters, such as total-pressure-loss coefficients and flow deviations, remain the weak assumptions in most of the otherwise sophisticated calculations of turbine flow conditions. Some of the areas are reviewed in which further efforts are needed. Since a turbine's performance ultimately depends on the detailed design of the balding, the paper concentrates on this aspect of turbine design and analysis.
Author

N77-12023# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
COMPRESSOR DESIGN AND EXPERIMENTAL RESULTS
H. B. Weyer *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 15 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

After an introduction to current techniques available to evaluate the axisymmetric flow field in turbomachines at design and off-design conditions, research was concentrated primarily on proving these calculation methods by comparing the results with corresponding experimental data from real test machines. Considered were: (1) A single-stage transonic compressor without inlet guide vanes; (2) a three-stage transonic compressor without inlet guide vanes; and (3) a 4-stage compressor with inlet guide vanes. Complete geometrical data and test results are provided.
G.G.

N77-12024# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
COMPARISON BETWEEN THE CALCULATED AND THE EXPERIMENTAL RESULTS OF THE COMPRESSOR TEST CASES
H. B. Weyer and R. Dunker *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 26 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

For the calculation of the compressor's overall performance,

one-dimensional techniques as well as duct flow and through-flow methods were used. No characteristic differences encounter from the various methods indicating that a severe effect of a more or less complete physical flow model does not exist. The deviations as far as observed with respect to the experiments are primarily due to the inaccuracy of the flow loss and flow turning predictions, particularly at off-design operating conditions. The duct-flow and through-flow calculation techniques were mainly utilized to compute in detail the compressor internal flow. Streamline curvature, matrix, and finite element methods thereby served as numerical procedures to resolve the flow equations. Concerning the flow parameters calculated outside of the blade rows no evident superiority was observed for any method even for the through-flow techniques although their physical background seems to be more accomplished taking for instance into account the effects of blade thickness, blade turning, a.s.o. Discrepancies in the experimental results are believed to be caused by an inexact estimation of the wall boundary-layer blockage, and by 3-dimensional flow effects which are not accounted for in the 2-dimensional calculation techniques. Author

N77-12025# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
TURBINE TEST CASES: PRESENTATION OF DESIGN AND EXPERIMENTAL CHARACTERISTICS
J. Chauvin and C. Sieverding *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 19 p (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

Full geometric data are presented for a two-stage, two-shaft HP-IP turbine for advanced gas turbine engines. Traverse data are available before and after each blade row, for total pressure, total temperature, static pressure and absolute angle. Author

N77-12026# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
TURBINES: PRESENTATION OF CALCULATED DATA AND COMPARISON WITH EXPERIMENTS
J. Chauvin *In* AGARD Through-Flow Calculations in Axial Turbomachinery Oct. 1976 24 p refs (For primary document see N77-12013 03-02)
Avail: NTIS HC A11/MF A01

Performance test results together with geometric design data for two axial flow turbomachines are detailed. Data include nominal 2pm and nominal mass flow as well as nominal pressure ratios and efficiencies. General information on utilized computer programs and calculation methods is included. G.G.

N77-11980# National Aeronautical Establishment, Ottawa (Ontario).
APPLICATION OF COMPUTED SHOCK STANDOFF DISTANCES FOR WINDTUNNEL CALIBRATION AT SUPERSONIC MACH NUMBERS LESS THAN 1.2
D. J. Jones *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 5 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11982*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTS PLANNED SPECIFICALLY FOR DEVELOPING TURBULENCE MODELS IN COMPUTATIONS OF FLOW FIELDS AROUND AERODYNAMIC SHAPES
Joseph G. Marvin *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 13 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01 CSCL 01A

N77-11983# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE IMPORTANCE OF EXPERIMENTALLY-DETERMINED CLOSURE CONDITIONS IN TRANSONIC BLADE-TO-BLADE FLOWS CALCULATED BY A TIME-DEPENDENT TECHNIQUE
M. Couston *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 23 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11985# Laboratoire d'Aerothermique du C.N.R.S., Meudon (France).
FOURIER ANALYSIS AND THE CORRELATION OF SPEED WITH NONSTATIONARY AERODYNAMICS [ANALYSE DE FOURIER ET CORRELATION DE VITESSE EN AERODYNAMIQUE INSTATIONNAIRE]
Pierre Gougat and Francoise Martin *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 7 p refs In FRENCH (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11986# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
PICKING UP AND GRAPHING OF THREE DIMENSIONAL FLOW FIELDS
H.-J. Graefe *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 12 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N77-12027*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FULL-SCALE CRASH TEST OF A CH-47C HELICOPTER
Claude B. Castle Washington Dec. 1976 38 p refs Film supplement L-1211 to this report is available on request (NASA-TM-X-3412; L10854) Avail: NTIS HC A03/MF A01 CSCL 01C

A full-scale crash test of a large troop/cargo carrying CH-47C helicopter was conducted at the Langley impact dynamics research facility. The crash test of this large helicopter was performed as part of a joint U.S. Army-NASA helicopter test program to provide dynamic structural and seat response data. The test, the procedures employed, the instrumentation, a general assessment of the resulting damage, and typical levels of accelerations experienced during the crash are reported. Various energy-absorbing seating systems for crew and troops were installed and instrumented to provide data for use in the development of design criteria for future aircraft. The crash conditions were selected to simulate known crash conditions and are representative of the 95th percentile accident environment for an autorotating helicopter. Visual examination of the crashed test specimen indicated irreparable damage to many of the structural components. The highest accelerations were recorded by the accelerometers located on the cabin floor in the aft section of the helicopter, directly above the primary impact location and on the floor of the cockpit above the secondary impact location(s). Author

N77-12028# Essex Corp., Alexandria, Va.
BACKLOG AND DELAY WITH WARTIME AIRLIFT Final Report
Robert McQuie Dec. 1975 67 p refs
(Contract N00014-75-C-0764)
(AD-A025959) Avail: NTIS HC A04/MF A01 CSCL 15/5

This report examines the ability of the Navy to deliver wartime passengers on short notice by operating its present fleet of transport planes as a nonscheduled airline. The backlog and delay that would result were estimated with the airfleet servicing four theaters. The estimates were based on multichannel queuing theory. The C-9B and the CT-39E were the most cost effective aircraft to add to the fleet. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N77-12029*# Ohio Univ., Athens. Dept. of Electrical Engineering.
DEMONSTRATION PROGRAM FOR OMEGA RECEIVER PROTOTYPE MICROCOMPUTER DATA PROCESSING
Robert W. Lilley Nov. 1976 11 p
(Grant NGR-36-009-017)
(NASA-CR-149226; TM-43) Avail: NTIS HC A02/MF A01 CSCL 17G

The JOLT (TM) commercial microcomputer, based on the MOS Technology 6502 processor chip, for use in Omega navigation system is evaluated. A computer program was prepared in hand-assembled code to demonstrate receiver operation. The processor provides binary processing with interrupts enabled, a carriage return is given to initialize the teleprinter, and a jump is performed to enter the program loop to wait for an interrupt. The program loop operates continuously testing the interrupt flag. The interrupt routine reads the receiver status word and determines whether the current time-slot is the A slot. If so, the interrupt flag, which is also the data index pointer, is reset to zero. The status word is stored in the status buffer. If the time-slot is not A, the interrupt flag/pointer is incremented by one to index the phase and status to the proper buffer words for later use by the print routine. Author

N77-12030*# Ohio Univ., Athens. Dept. of Electrical Engineering.
AN ASSEMBLER FOR THE MOS TECHNOLOGY 6502 MICROPROCESSOR AS IMPLEMENTED IN JOLT (TM) AND KIM-1 (TM)
Robert W. Lilley Nov. 1976 41 p
(Grant NGR-36-009-017)
(NASA-CR-149227; TM-44) Avail: NTIS HC A03/MF A01 CSCL 17G

Design of low-cost, microcomputer-based navigation receivers, and the assembler are described. The development of computer software for microprocessors is materially aided by the assembler program using mnemonic variable names. The flexibility of the environment provided by the IBM's Virtual Machine Facility and the Conversational Monitor System, make possible the convenient assembler access. The implementation of the assembler for the microprocessor chip serves a part of the present need and forms a model for support of other microprocessors. Author

N77-12031*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPECTRALLY BALANCED CHROMATIC LANDING APPROACH LIGHTING SYSTEM Patent Application
Wendell D. Chase, inventor (to NASA) Filed 10 Dec. 1976 21 p
(NASA-Case-ARC-10990-1; US-Patent-Appl-SN-749420) Avail: NTIS HC A02/MF A01 CSCL 17G

A landing approach lighting system which corrects for the effects of chromatic aberration of the human eye to help prevent a pilot from making misjudgments leading to landings short of a runway threshold is described. The system utilizes red warning lights to delineate the runway approach with additional blue lights juxtaposed with the red lights such that the red lights are chromatically balanced. The red/blue point light sources result in the phenomenon that the red lights appear in front of the blue lights with about one and one-half times the diameter of the blue. To a pilot observing these lights along a glide path, those red lights directly below appear to be nearer than the blue lights. For those lights farther away seen in perspective at oblique angles, the red lights appear to be in a position closer to the pilot and hence appear to be above the corresponding blue lights. NASA

N77-12032*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GENERALIZATION AND REFINEMENT OF AN AUTOMATIC LANDING SYSTEM CAPABLE OF CURVED TRAJECTORIES
Windsor L. Sherman Washington Nov. 1976 37 p refs
(NASA-TN-D-8336; L-10686) Avail: NTIS HC A03/MF A01 CSCL 17G

Refinements in the lateral and longitudinal guidance for an automatic landing system capable of curved trajectories were studied. Wing flaps or drag flaps (speed brakes) were found to provide faster and more precise speed control than autothrottles. In the case of the lateral control it is shown that the use of the integral of the roll error in the roll command over the first 30 to 40 seconds of flight reduces the sensitivity of the lateral guidance to the gain on the azimuth guidance angle error in the roll command. Also, changes to the guidance algorithm are given that permit pi-radian approaches and constrain the airplane to fly in a specified plane defined by the position of the airplane at the start of letdown and the flare point. Author

N77-12033# Rockwell International Corp., Anaheim, Calif. Autonetics Group.
MICRO NAVIGATOR (MICRON) PHASE 2A. VOLUME 2: TECHNICAL REPORT Final Report, 1 Apr. 1974 - 1 Aug. 1975
Joseph M. Miller Feb. 1976 531 p refs
(Contract F33615-74-C-1099)
(AD-A021526; C74-455/201-Vol-1; AFAL-TR-75-210-Vol-1) Avail: NTIS CSCL 17/7

The Micro Navigator (MICRON) is a low-cost highly reliable, and moderately accurate strapdown inertial navigator. The heart of the MICRON system is the microelectrostatic gyro (MESG), an instrument which incorporates an all-attitude, whole-angle readout from an electrostatically suspended rotor. Under previous Air Force contracts two developmental navigation systems (N57A-1 and N57A-2) were developed. The objective of the MICRON Phase 2A contract was to test N57A-1 and N57A-2; to design, fabricate and integrate two gyro subassemblies and one gyro test station; to test gyros and gyro subassemblies; and to perform analyses, studies and trade-offs for use in defining the MICRON system. Both N57A systems were flight tested and the capability of the system to meet the position accuracy requirement was demonstrated. N57A-1 was used to demonstrate in-motion polhode damping. System reliability screen, Scorsby and heading sensitivity tests were successfully conducted on N57A-2. GRA

N77-12034# Coast Guard Research and Development Center, Groton, Conn.
DEVELOPMENT OF A DISTRESS ALERTING AND LOCATING SYSTEM (DALS) Final Report, Jul. 1973 - Jan. 1975
W. A. DeGeorge and J. R. Lindeblad Nov. 1975 97 p
(CG Prog. 761140)
(AD-A023841; CGR/DC-18/75; USCG-D-186-75) Avail: NTIS HC A05/MF A01 CSCL 06/7

An automated method of determining a distressed vessel's situation and position could be useful in the U. S. Coast Guard's search and rescue mission. Evaluation of commercially available retransmitting equipment, modified for use as a Distress Alerting and Locating System (DALS) was undertaken to determine its capabilities of automatically locating and identifying a vessel in distress, usefulness as a buoy position monitoring system, and usefulness as a vessel tracking system. The system employs a hand-held radio-navigational signal retransmitting device which, when energized by a recreational boater in time of distress, transmits a distress alerting and identifying signal along with local area navigational aid information to a DALS base station. Provision exists for extension of the operating range of the system through use of a telemetry equipment deployed in a vessel, aircraft or additional shore station. The system can use either Omega or LORAN-C navigational signals, or a combination of inputs from both navigational aids. GRA

N77-12035# Transportation Systems Center, Cambridge, Mass.
TERRESTRIAL RADIODETERMINATION POTENTIAL USERS AND THEIR REQUIREMENTS Interim Report, Mar. - Nov. 1975

S. Cantor, E. Farr, and R. Kodis Jul. 1976 38 p refs Sponsored by Dept. of Transportation and Office of the Assistant Secretary for Systems Development and Technology, Washington D. C.
(PB-255839/3; DOT-TSC-OST-76-7) Avail: NTIS HC A03/MF A01 CSCL 17G

Information gathered during a preliminary study of the application of electronic techniques to geographical position determination on land and on inland waterways is summarized. Systems incorporating such techniques have been called terrestrial radiodetermination (TRD) systems. Their most common application has been to locate and track a large number of vehicles in real time. These and other potential uses and requirements are identified and discussed. The design and operation of a number of TRD and TRD-related systems that have been or soon will be deployed for demonstration are described. GRA

N77-12036# Massachusetts Inst. of Tech., Cambridge. Lab. of Electronics.
NARROW-BAND PASSIVE SYSTEMS THEORY WITH APPLICATIONS TO POSITIONING AND NAVIGATION Ph.D. Thesis
Jose Manuel Fonseca DeMoura 28 Apr. 1976 216 p refs (Contract DAAB07-75-C-1346)
(AD-A025743; TR-490) Avail: NTIS HC A10/MF A01 CSCL 17/7

The passive tracking problem with narrow-band and linear constraints on geometry and motion is considered. In Part I a model is developed which exhibits explicitly the nonhomogeneous received wave field structure induced by the spatial baseline (observer's array) and/or temporal diversity (source motion). This model encompasses the basic phenomena of many practical situations, and is sufficiently simple to be useful in analytical studies. The fundamental question of global parameter identifiability is pursued, with emphasis on passive ranging. The structure and global and local performance of the optimal and suboptimal receivers are examined, and, by considering two limiting geometries (distant and close observer), analytical intuitively pleasing expressions are derived which bound the mean-square performance. In Part 2 a practical hybrid solution to the passive tracking problem is developed, and a compromise is achieved between global parameter identifiability and receiver complexity. The behavior of the hybrid algorithm and its sensitivity to the underlying model assumptions of linear path perturbations are analyzed. The theory of passive tracking is applied to positioning in such situations as air traffic control, underwater acoustics, and navigation (orbiting and geostationary satellites). GRA

N77-12037# Naval Electronics Lab. Center, San Diego, Calif.
ANALYSIS OF IN-FLIGHT OMEGA DATA (DATA TAKEN 26 JANUARY - 7 FEBRUARY 1969 ARE COMPARED WITH PREDICTED VALUES FOR PATHS FROM HAWAII TO SAN DIEGO, SAMOA, AND WAKE AND FROM SAMOA AND WAKE TO HAWAII) Research and Development Technical Report, Jan. - Apr. 1975
Michael J. Dick 8 Apr. 1976 36 p refs
(NELC Proj. A107)
(AD-A025926; NELC-TR-1984) Avail: NTIS HC A03/MF A01 CSCL 17/7

Measured amplitude data for 10.2 and 13.6 kHz were compared with the corresponding theoretical amplitudes along these paths. Various ionospheric profiles were used in the theoretical calculations in order to find an amplitude curve which fit the data. The Hawaii to San Diego path was so homogeneous that midpath values for ionospheric parameters were used along the entire path. Theory corresponded with data. Both similarities and differences were found among the Hawaii to Wake and Wake to Hawaii data. The Hawaii to Samoa and Samoa to Hawaii paths were characterized by rapid oscillation of amplitude in the region near the geomagnetic equator. Further investigation is recommended. Author (GRA)

N77-12038# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF THE POSITION LOCATION AND REPORTING SYSTEM'S PERFORMANCE CHARACTERISTICS M.S. Thesis
Walter Woodrow Sevon, Jr. Mar. 1976 51 p refs
(AD-A025437) Avail: NTIS HC A04/MF A01 CSCL 17/7

The variables which significantly affect accuracy in two position location and reporting systems are examined in this thesis. Some physical and mathematical characteristics of the two systems are described. A model is developed to evaluate system accuracy. The significant variables are identified using the techniques of Analysis of Variance and Stepwise Linear Regression on test data from the two systems. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N77-12039*# Douglas Aircraft Co., Inc., Long Beach, Calif.
ADVANCED COMPOSITE RUDDERS FOR DC-10 AIRCRAFT: DESIGN, MANUFACTURING, AND GROUND TESTS Final Technical Report, 18 Jan. 1974 - 30 Apr. 1976
George M. Lehman, D. M. Purdy, A. Cominsky, A. V. Hawley, M. P. Amason, J. T. Kung, R. J. Palmer, N. B. Purves, P. J. Marra, G. R. Hancock et al Washington NASA 30 Apr. 1976 144 p
(Contract NAS1-12954)
(NASA-CR-145068) Avail: NTIS HC A07/MF A01 CSCL 01C

Design synthesis, tooling and process development, manufacturing, and ground testing of a graphite epoxy rudder for the DC-10 commercial transport are discussed. The composite structure was fabricated using a unique processing method in which the thermal expansion characteristics of rubber tooling mandrels were used to generate curing pressures during an oven cure cycle. The ground test program resulted in certification of the rudder for passenger-carrying flights. Results of the structural and environmental tests are interpreted and detailed development of the rubber tooling and manufacturing process is described. Processing, tooling, and manufacturing problems encountered during fabrication of four development rudders and ten flight-service rudders are discussed and the results of corrective actions are described. Non-recurring and recurring manufacturing labor man-hours are tabulated at the detailed operation level. A weight reduction of 13.58 kg (33 percent) was attained in the composite rudder. Author

N77-12040*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
AN EXPERIMENTAL INVESTIGATION OF THE FLAP-LAG STABILITY OF A HINGELESS ROTOR WITH COMPARABLE LEVELS OF HUB AND BLADE STIFFNESS IN HOVERING FLIGHT Final Report
H. C. Curtiss, Jr. and W. F. Putman Jun. 1976 33 p refs
(Contract NAS2-7615)
(NASA-CR-151924; AMS-1300) Avail: NTIS HC A03/MF A01 CSCL 01C

An experimental investigation of the flap-lag stability of a hingeless rotor in hovering flight is presented and discussed. The rotor blade and hub configuration were selected such that the hub and blade had comparable levels of bending stiffness. Experimental measurements of the lag damping were made for various values of rotor rotational speed and blade pitch angle. Specifically at a blade pitch angle of 8 deg at three-quarters radius, the lag damping was determined over a range of rotational speeds from 200 RPM to 320 RPM and also over a range of blade pitch angles from 0 deg to 8 deg. Author

N77-12041*# General Electric Co., Cincinnati, Ohio.
ANALYSIS OF PRESSURE DISTORTION TESTING Final Report
K. E. Koch and R. L. Rees Washington NASA Dec. 1976 103 p refs
(Contract NAS3-19522)
(NASA-CR-2766; Rept-76AEG272) Avail: NTIS HC A06/MF A01 CSCL 20D

The development of a distortion methodology, method D, was documented, and its application to steady state and unsteady

data was demonstrated. Three methodologies based upon DIDENT, a NASA-LeRC distortion methodology based upon the parallel compressor model, were investigated by applying them to a set of steady state data. The best formulation was then applied to an independent data set. The good correlation achieved with this data set showed that method E, one of the above methodologies, is a viable concept. Unsteady data were analyzed by using the method E methodology. This analysis pointed out that the method E sensitivities are functions of pressure defect level as well as corrected speed and pattern. Author

N77-12042# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

ARMY PRELIMINARY EVALUATION JOH-58A HELICOPTER WITH LOW REFLECTIVE PAINT AND INFRARED COUNTERMEASURE EXHAUST SYSTEM Final Report, 1 Jul. - 14 Oct. 1975

Charles L. Thomas, Tom P. Benson, and Robert M. Buckanin Dec. 1975 105 p refs
(AD-A024727; USAAEFA-75-11) Avail: NTIS HC A06/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted an Army Preliminary Evaluation of a JOH-58A helicopter painted with a low reflective paint and equipped with a prototype infrared countermeasure exhaust system from 1 July through 14 October 1975. The testing was conducted at Edwards Air Force Base and at Point Mugu Naval Air Station, California. Results of these tests were compared with test results from earlier evaluations of the OH-58A performance and handling quality characteristics and with preliminary base-line testing performed during this evaluation. One deficiency and two shortcomings were noted during this evaluation. Although not classified as a deficiency or shortcoming, the most significant finding in this evaluation was the serious degradation in hover and level flight performance when the rotor blades are painted with low reflective paint. GRA

N77-12043# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

AIRWORTHINESS AND FLIGHT CHARACTERISTICS EVALUATION: YAH-1S IMPROVED COBRA AGILITY AND MANEUVERABILITY HELICOPTER Final Report, 17 Mar. - 17 Apr. 1975

Gary L. Skinner, William Y. Abbott, and Richard C. Tarr Aug. 1975 114 p refs
(AD-A025476; USAAEFA-74-34) Avail: NTIS HC A06/MF A01 CSCL 01/1

Limited flight tests of a prototype aircraft were conducted at 3 test facilities at various altitudes. Testing concentrated on hover and level flight performance, controllability, and low-speed flight characteristics at heavy gross weight, high density altitude test conditions. The YAH-1S represents a significant improvement over the AH-1G/Q helicopter by virtue of its increased useful load-carrying capability, directional controllability and control margin, and hover performance capability. The control system characteristics of the YAH-1S failed to meet several requirements of applicable paragraphs of military specification MIL-H-8501A and the approved BHC deviations to MIL-H-8501A against which they were tested, but were still considered satisfactory. One shortcoming was noted. GRA

N77-12044# Rock Island Arsenal, Ill.

MEASUREMENT OF THE STATIC INFLUENCE COEFFICIENT OF THE AH-1G COBRA FUSELAGE Preliminary Report, 1 Feb. 1975 - 30 Jan. 1976

Donald E. Frericks, Edward R. Lindquist, Robert A. Peterson, and Robert J. Radkiewicz 1 Feb. 1976 682 p refs
(AD-A025114; RIA-R-TR-76-005) Avail: NTIS HC A99/MF A01 CSCL 01/3

An AH-1G Cobra Helicopter (minus the tailsection) was mounted in a vertical position by personnel at the Ware Simulation Center, Rock Island Arsenal, and the response of the fuselage to various applied loads was then measured. The response, measured as deflections in the direction of applied load, will be used by Bell Helicopter Company for the validation of their NASTRAN math model of the Cobra Helicopter. Initial results of the test indicate good agreement between the experimentally measured deflections and the math model predicted deflections. GRA

N77-12045# United Technologies Corp., Stratford, Conn. Sikorsky Aircraft Div.

VALIDATION OF THE ROTORCRAFT FLIGHT SIMULATION PROGRAM (C81) FOR ARTICULATED ROTOR HELICOPTERS THROUGH CORRECTION WITH FLIGHT DATA Final Report

S. J. Briczinski May 1976 62 p refs
(Contract DAAJ02-74-C-0046; DA Proj. 1F2-62208-AH-90)
(AD-A025934; SER-50956; USAAMRDL-TR-76-4) Avail: NTIS HC A04/MF A01 CSCL 09/2

The Rotorcraft Flight Simulation Program C81 (Version AGAJ74) was run, simulating a wide variety of flight conditions, in order to gather data for comparison to flight test data and data originating from other analyses to determine the accuracy with which the C81 program predicts various characteristics of articulated rotor helicopters. The C81 input data were prepared, modeling the H-53 and S-67 helicopters, and runs were made to obtain trim, performance, stability, time history response, and rotor loads data predictions. The results of this study of the application of C81 to articulated rotor helicopters pointed out severe limitations to its application to rotors with any significant blade parameter discontinuities. Even under most favorable circumstances, this study did not indicate any significant increase in accuracy over other methods available for handling the disciplines covered by C81. While the ability to treat performance, stability and control, and rotor loads all within the same program has some advantages, in this case the advantages appear to be offset by excessive running times required for performance and maneuver response problems which normally can be handled by much simpler and quicker running programs. Author (GRA)

N77-12046# Bell Helicopter Co., Fort Worth, Tex.

HIGH-SURVIVABLE TRANSMISSION SYSTEM Final Report, Jan. 1974 - Aug. 1975

David J. Richardson May 1976 114 p
(Contract DAAJ02-74-C-0019; DA Proj. 1F2-62205-AH-88)
(AD-A025930; USAAMRDL-TR-76-8) Avail: NTIS HC A06/MF A01 CSCL 01/3

The purpose of this program was to design, fabricate, and test an integrated survivable transmission system for the AH-1G/Q helicopter that would be capable of operation for 60 minutes following the loss of the normal lubrication system. Utilizing the results of previous contractual research efforts, an engineering analysis was performed which produced a design that included an emergency lubrication system in conjunction with some improved components. One transmission which incorporated the design modifications was fabricated and tested. The test program included an emergency lubrication test run in which a ballistic hit resulting in total loss of the main lubrication system was simulated, and the transmission was run on emergency lubrication at 950 input horsepower (85% of takeoff horsepower) with 25 horsepower through the tail rotor until failure occurred. The transmission ran 4.0 hours following the loss of the normal lubrication system. After 4.0 hours of emergency running, the teeth of the lower sun gear were stripped off, resulting in complete loss of the mast torque and termination of the test. The design concept for the high-survivable transmission (HST) system tested during this program appears to be more than adequate to provide 60 minutes of transmission operation following the loss of the normal lubrication system. Test results indicate that the transmission could have operated indefinitely if the emergency oil had not leaked past the input seal. Author (GRA)

N77-12047# Air Force Weapons Lab., Kirtland AFB, N.Mex.

ANALYSIS OF DYNAMIC AIRCRAFT RESPONSE TO BOMB DAMAGE REPAIR Final Report

Lawrence D. Hokanson Nov. 1975 54 p refs
(AF Proj. 2104)
(AD-A025647; AFWL-TR-75-138) Avail: NTIS HC A04/MF A01 CSCL 01/5

Expedient repair methods and settlement of expedient repair materials create roughness in repaired airfield pavement surfaces. The effect of this roughness on aircraft operated over a repair has been of serious concern to organizations designing repair

procedures. An analysis is made of the dynamic response of F-4 aircraft when operated over an actual AM-2 mat Bomb Damage Repair (BDR) surface utilizing data obtained in FY73 BDR full scale testing. A computer code, entitled TAXI, yields the g loadings on various parts of the aircraft, the strut forces, and the strut displacements when the repair profile is used as program input. It was determined that a speed of 45 fps yields the largest responses. Running the program with variations of the profile to simulate settlement of the backfill indicated that the initial construction roughness creates more adverse effects than settlement within the repair area of up to 0.4 foot. Consequently, any effort to reduce roughness should concentrate on repair surface grading rather than improving the quality of the backfill material. GRA

N77-12048# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
ENVIRONMENTAL EFFECTS ON MAINTENANCE COSTS FOR AIRCRAFT EQUIPMENT Final Report, Nov. 1973 - Jan. 1976
Thomas K. Moore May 1976 33 p refs
(AF Proj. 7351)
(AD-A025801; AFML-TR-76-31) Avail: NTIS HC A03/MF A01 CSCL 01/3

A series of mathematical models of the influence of environmental-effects on maintenance costs was constructed using linear regression analysis. The equipment whose behavior was modeled was the KC-135 Doppler Radar and the F-4E engine starter. Models explaining more than 20% of the variation in maintenance cost as a result of weather factors were developed, where only the two most current months' weather was considered. Recommendations for further research using more sophisticated model development techniques are presented. A limited economic analysis of some life cycle cost implications of failure countermeasures for increased environmental resistance is given. GRA

N77-12049# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
F-111A WING FATIGUE TEST PROGRAM Final Report, 24 Mar. 1971 - 10 Jul. 1974
Robert L. Schneider Apr. 1976 47 p refs
(AD-A025795; AFFDL-TR-76-30) Avail: NTIS HC A03/MF A01 CSCL 01/3

An F-111A wing was fatigue tested in the full stores configuration for evaluation of the wing, wing hard points, and fixed pylons. The spectrum consisted of nine test conditions with loads applied at three wing sweep angles: 25, 50, 72.5 deg. The repeated application of these test conditions simulated 24,000 hrs of service (6 test lives). Upon completion of the six test lives, the spectrum was modified and cycling continued for an additional four test lifetimes (16,000 hrs). After completion of the 10th fatigue test lifetime, 65% limit load constant amplitude cycles were applied until failure occurred. The F-111A wing has a satisfactory fatigue life for the spectrum imposed upon it. GRA

N77-12050# Naval Air Test Center, Patuxent River, Md.
DEVELOPMENT OF A TOW CAPABILITY FOR THE HH-3F HELICOPTER Final Report
J. E. Ludwig, F. A. Pinegar, G. Serotsky, J. H. Edris, and G. E. Clark Apr. 1976 79 p refs
(AD-A025790; NATC-RW-9R-76; USCG-D-51-76) Avail: NTIS HC A05/MF A01 CSCL 01/3

An extensive evaluation was conducted to determine the capability of the HH-3F helicopter to tow the Fast Surface Delivery (FSD) System. The aircraft flying qualities, aircraft response to simulated emergencies, Automatic Flight Control System, and the simplicity and reliability of the tow equipment enhance the ability of the HH-3F helicopter to fulfill the requirements of the U.S. Coast Guard tow mission. Mission limitations are imposed by the low power margin at high gross weights in the low speed tow regime. Inefficient transmission oil cooler operation limits the amount of time allowed in a downwind tow condition. Further testing is recommended to determine pilot fatigue limitations due to unusual aircraft attitudes during tow operations. Also, additional testing is necessary to determine the effects of higher sea states on the aircraft and FSD combination. Within the scope of this evaluation, the HH-3F helicopter and FSD tow combination is satisfactory for the U.S. Coast Guard operational tow mission. GRA

N77-12051# Adaptronics, Inc., McLean, Va.
CONTROLLERS AND AUTOPILOT MODES FOR RPV SIMULATION PROGRAM Final Technical Report, 1 Nov. 1973 - 30 Jun. 1974
Milford R. Derrick Wright-Patterson AFB, Ohio AMRL Apr. 1976 145 p refs
(Contract F33615-74-C-4033; AF Proj. 7233)
(AD-A025792; AMRL-TR-74-90) Avail: NTIS HC A07/MF A01 CSCL 01/3

Several sets of conventional roll-pitch-yaw control systems are synthesized for a conventional air-to-ground strike RPV. Linear and bang-bang logics are developed for the inner (rate control) loops. Outer (position control) loops and automatic target homing (guidance) loops are also developed. The control systems are programmed for a digital, real-time simulation (implemented on the AMRL PDP-12 Computer) of the RPV strike phase. The control system simulator is intended for use as a tool to evaluate the effectiveness of control augmentation for manual piloting of an RPV. GRA

N77-12052# Boeing Vertol Co., Philadelphia, Pa.
ADVANCED HELICOPTER STRUCTURAL DESIGN INVESTIGATION. VOLUME 1: INVESTIGATION OF ADVANCED STRUCTURAL COMPONENT DESIGN CONCEPTS Final Report, Jun. 1974 - May 1975
Donald J. Hoffstedt and Sidney Swatton Mar. 1976 368 p refs
(Contract DAAJ02-74-C-0066; DA Proj. 1F2-62208-AH-90)
(AD-A024662; D210-10965-1; USAAMRDL-TR-75-56A) Avail: NTIS HC A16/MF A01 CSCL 01/3

A preliminary design study for a complete helicopter, incorporating advanced structural design concepts and advanced material, was conducted by the Boeing Vertol Company. The purpose was to evaluate the impact of advanced concepts and materials on the payload and configuration of a medium utility transport helicopter when compared to a baseline helicopter of conventional design. Major structural systems were identified with assessment of structural efficiency, cost/producibility, fail-safety, safety, reliability, maintainability, survivability, and crashworthiness. In addition, risk and feasibility assessment of the advanced structural systems was conducted. Author (GRA)

N77-12053# Air Force Weapons Lab., Kirtland AFB, N.Mex.
AIRCRAFT IONIZING DOSES AND DOSE RATES FROM RADIOACTIVE CLOUDS AND FALLOUT Final Report
Rayford P. Patrick and George D. Arnett Apr. 1976 46 p refs
(AF Proj. 8809)
(AD-A024896; AFWL-TR-75-214) Avail: NTIS HC A03/MF A01 CSCL 15/6

Aircraft flying over surface areas contaminated by fallout from radioactive clouds from surface nuclear detonations accumulate ionizing doses. An investigation of this situation was accomplished, and the dose and dose rate resulting from such fly-overs are presented. The dose rates were also determined for aircraft approaching radioactive clouds and fallout contaminated surface areas. The results are presented in general terms, and examples are presented to illustrate the manner of applying the general results to specific situations. Author (GRA)

N77-12054# Solar, San Diego, Calif.
DEVELOPMENT OF EROSION RESISTANT CLADDINGS FOR HELICOPTER ROTOR BLADES Final Summary Report, 2 Jan. 1974 - 30 Nov. 1975
Victor S. Moore and Alvin R. Stetson Mar. 1976 117 p refs
(Contract DAAG46-74-C-0054)
(AD-A024894; RDR-1788-2; DRSAV-76-16; AMMRC-CTR-76-9) Avail: NTIS HC A06/MF A01 CSCL 13/8

The objective of this program is to optimize the Solar boriding process to obtain a well supported boride on a metallic substrate (clad) and to evaluate the erosion resistance and other critical properties of a clad substrate. Processes were also developed for adhesive bonding the cladding to the leading edges of helicopter rotor blades. Test results demonstrated that dense boride coatings

on steel and titanium alloys can reduce the dust erosion rate, compared to uncoated metal, by 30 to several hundred fold. Overall the borided titanium alloy clad appeared most favorable of the four clad alloys evaluated. The extreme hardness of TiB2 afforded essentially complete erosion protection with a coating thickness of only 0.0005 inch. Resistance to rain erosion, impact, and saline water corrosion also favored the titanium alloy. Of the steels, the alpha alloy, SAE 430, was best in performance in erosion, impact and saline water corrosion. Performance of the boride coated 430 and Ti-6Al-4V alloys in rain erosion tests was excellent. The use of a boride coated metallic cladding to reduce rain and dust erosion to extremely low levels was demonstrated. Forming of SAE 430 and Ti-6Al-4V alloys before boriding, maintaining dimensions during boriding, and the subsequent adhesive bonding of the borided shapes to sections of metallic and glass-epoxy rotor blades were shown to be feasible. GRA

N77-11973# Boeing Vertol Co., Philadelphia, Pa.
THE USE OF COMPUTERS IN ROTARY WING TESTING
William G. S. Hardy and Edward J. Pyne *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 12 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11979# National Aerospace Lab., Amsterdam (Netherlands).
WIND TUNNEL TESTS AND AERODYNAMIC COMPUTATIONS; THOUGHTS ON THEIR USE IN AERODYNAMIC DESIGN
J. W. Slooff *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 6 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N77-12055*# Systems Technology, Inc., Hawthorne, Calif.
INVESTIGATION OF THE USE OF AN ELECTRONIC MULTIFUNCTION DISPLAY AND AN ELECTROMECHANICAL HORIZONTAL SITUATION INDICATOR FOR GUIDANCE AND CONTROL OF POWERED-LIFT SHORT-HAUL AIRCRAFT Final Report
Warren F. Clement Aug. 1976 173 p refs
(Contract NAS2-8973)
(NASA-CR-137922; TR-1072-1) Avail: NTIS HC A08/MF A01 CSCL 01D

The use which pilots make of a moving map display from en route through the terminal area and including the approach and go-around flight phases was investigated. The content and function of each of three primary STOLAND displays are reviewed from an operational point of view. The primary displays are the electronic attitude director indicator (EADI), the horizontal situation indicator (HSI), and the multifunction display (MFD). Manually controlled flight with both flight director guidance and raw situation data is examined in detail in a simulated flight experiment with emphasis on tracking reference flight plans and maintaining geographic orientation after missed approaches. Eye-point-of-regard and workload measurements, coupled with task performance measurements, pilot opinion ratings, and pilot comments are presented. The experimental program was designed to offer a systematic objective and subjective comparison of pilots' use of the moving map MFD in conjunction with the other displays. Author

N77-12056# European Space Agency, Paris (France).
FLIGHT SIMULATOR EVALUATION OF AN ELECTRONIC PARAVISUAL GUIDANCE INDICATOR
Josef Thomas, Ernst Kohnen et al Nov. 1976 61 p refs Transl. into ENGLISH of 'Erprobung einer elektron. erzeugten paravisuellen Flugfuehrungsanzeige im Flugsimulator', DFVLR, Brunswick Report DLR-FB-76-28, 6 May 1976 Original report in GERMAN previously announced as N76-33203 Original German report available from DFVLR, Cologne DM 21.30
(ESA-TT-350; DLR-FB-76-28) Avail: NTIS HC A04/MF A01

An electronic paravisual indicator presenting a checkerboard pattern moving in two axes in a head-down display was evaluated in a moving cock-pit flight simulator. The experiment was directed towards the effects of the indicator on piloting accuracy and pilot workload in manually controlled ILS and flight director approaches. In the overall assessment, based on objective performance criteria and subjective pilot ratings, the statistical evaluation of the objective test data showed no significant influence of the indicator on the performance criteria whereas the pilot ratings suggest that the indicator may be useful for manual control of the lateral motion of an aircraft. Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N77-12057*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
INFLUENCE OF AIR HUMIDITY ON COMPRESSOR AND TURBINE EFFICIENCY DETERMINED FROM EXPERIMENTAL DATA
B. D. Fishbeyn Washington NASA Jul. 1976 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Aviats. Tekh. (USSR), v. 18, no. 3, 1975 p 154-158
(Contract NASw-2789)
(NASA-TT-F-17073) Avail: NTIS HC A02/MF A01 CSCL 21E

Humidity is known to affect the isentropic exponent and the gas constant of the working fluid. The errors due to neglect of humidity are assessed which arise in the determination of compressor and turbine efficiency from measurements of the flow parameters. Author

N77-12058*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
ALTERNATIVES FOR JET ENGINE CONTROL Final Technical Report, 1 Mar. 1975 - 29 Feb. 1976
R. J. Leake and M. K. Sain 29 Feb. 1976 42 p refs
(Grant NsG-3048)
(NASA-CR-146531) Avail: NTIS HC A03/MF A01 CSCL 21E

Approaches are developed as alternatives to current design methods which rely heavily on linear quadratic and Riccati equation methods. The main alternatives are discussed in two broad categories, local multivariable frequency domain methods and global nonlinear optimal methods. Author

N77-12059*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF NASA AERODYNAMIC AND HEAT TRANSFER STUDIES IN TURBINE VANES AND BLADES
Thomas P. Moffitt, Francis S. Stepka, and Harold E. Rohlik 1976 52 p refs Presented at Aerospace Eng. and Mfg. Meeting, San Diego, Calif., 29 Nov. - 2 Dec. 1976; sponsored by SAE
(NASA-TM-X-73518) Avail: NTIS HC A04/MF A01 CSCL 21E

Aerodynamic effects of trailing edge geometry, hole size, angle, spacing, and shape were studied in two- and three-dimensional cascades and in a warm turbine test series. Heat transfer studies were carried out in various two- and three-dimensional test facilities in order to provide corresponding heat transfer data. Results are shown in terms of cooling effectiveness and aerodynamic efficiency for various coolant fractions, coolant-primary temperature ratios, and cooling configurations. Author

N77-12060# Army Air Mobility Research and Development Lab., Moffett Field, Calif.
IN-FLIGHT FAR-FIELD MEASUREMENT OF HELICOPTER IMPULSIVE NOISE
Donald A. Boxwell and Fredric H. Schmitz 1976 15 p refs
(AD-A025979) Avail: NTIS HC A02/MF A01 CSCL 20/1

An in-flight technique for measuring UH-1H helicopter impulsive noise (sometimes called 'blade slap') by stationkeeping with a quiet instrumented lead aircraft was found to be highly successful. Far-field quantitative acoustic waveforms and radiation patterns were easily obtained over a wide, continuous range of UH-1H flight conditions, including several areas known to produce annoying acoustic radiation. The data collected using this technique were not (to any significant degree) contaminated by transmission path distortions that have hindered measurement efforts in the past. The major finding of this initial measurement program was: judging the occurrence and severity of a helicopter's radiated impulsive noise signature from cabin-based noise measurements can be misleading. For the UH-1H helicopter, reduction in cabin audible impulsive noise levels may be necessary but certainly not sufficient to indicate that far-field impulsive noise radiation has been reduced. The following three distinct types of impulsive noise are radiated by the UH-1H helicopter while flying between 80 and 115 knots at descent rates from zero to 1,000 ft/min: (1) a series of positive pressure pulses believed to be related to blade-tip vortex interaction. These pulses are responsible for the crisp popping sound of the radiated noise; (2) a negative pressure disturbance that rapidly increases in amplitude with forward velocity, becoming quite intense and sawtoothed in shape at 115 knots IAS; and (3) a narrow positive pressure spike that closely follows that sawtooth-shaped negative pressure pulse at high airspeeds (115 knots). GRA

N77-12061# Pratt and Whitney Aircraft, East Hartford, Conn.
EVALUATION OF AUGMENTER LIGHT-OFF DETECTION SYSTEMS Final Technical Report, 1 Apr. 1974 - 31 Mar. 1975
T. G. Lenox May 1975 37 p refs
(Contract F33657-73-C-0619; AF Proj. 668A)
(AD-A025321; PWA-5277; AFAPL-TR-75-57) Avail: NTIS HC A03/MF A01 CSCL 21/2

This program was conducted to evaluate direct sensing augmenter flame detection systems to determine suitability for application in future augmented aircraft engines. Experimental testing of commercially available flame detection devices and Pratt and Whitney Aircraft designed optical sensing probes was conducted to determine those components offering the most potential for future development. A survey of detector units was conducted, and several promising units, in conjunction with optical probes, optic transmission cables and readout equipment were subjected to laboratory, burner rig, and engine tests. Four augmenter light-off detection system configurations consisting of a Geiger-Mueller phototube and two different semiconductor type detectors were tested at four different probe locations on an F100 engine afterburner. Engine testing was conducted at NASA Lewis Research Center at simulated altitude conditions. The results of this testing showed that a Geiger-Mueller type phototube detector system directly mounted to the engine case, performed the best and is recommended for further development. Author (GRA)

N77-12062# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONCEPTUAL STUDY OF A LOW COST TURBOJET ENGINE M.S. Thesis
Tommy J. Kent Mar. 1976 87 p refs
(AD-A025652; GAE/AE/76M-2) Avail: NTIS HC A05/MF A01 CSCL 21/5

One candidate for an inexpensive engine is a turbojet constructed by adding a combustion chamber and nozzle to a commercial turbocharger for a reciprocating engine. Two turbocharger-engines were produced in this way capable of handling approximately .6 lb/sec and 1.5 lb/sec airflow. A performance analysis using thermodynamic cycle analysis techniques was done to predict the thrust that could be generated by these engines. The maximum thrust predicted was 27 lb and 67 lb dry; with an afterburner, 36 lb and 96 lb was expected. A combustion chamber and nozzle were added to the turbochargers and both were mounted on a test stand and successfully operated. Thrust was increased by various improvements to 60 lb. The performance parameters of possible interest were studied with particular emphasis placed on thrust, weight flow of the air, specific fuel consumption, compressor pressure ratio, and temperature of the gases at the compressor, turbine, and nozzle. GRA

N77-12063# United Technologies Corp., Windsor Locks, Conn. Hamilton Standard Div.
ADVANCED V/STOL PROPELLER CRITICAL COMPONENTS INVESTIGATION Final Report, Feb. 1973 - Jun. 1975
E. H. Walz Apr. 1976 231 p refs
(Contract DAAJ02-72-C-0012; DA Proj. 1G1-62207-AA-72)
(AD-A024663; USAAMRDL-TR-76-1) Avail: NTIS HC A11/MF A01 CSCL 01/3

This report presents the results of an experimental program to evaluate a full-scale Borsic aluminum composite structure spar/titanium propeller barrel retention system and a high-contact-angle duplex tapered roller bearing for an advanced technology 2000-SHP propeller system. Author (GRA)

N77-12064*# Army Air Mobility Research and Development Lab., Hampton, Va.
A NEW CAPABILITY FOR PREDICTING HELICOPTER ROTOR NOISE IN HOVER AND IN FLIGHT
Thomas J. Brown and Fereidoun Farassat 1976 14 p refs
(Grant NGR-09-010-085)
(NASA-CR-147138; AD-A025982) Avail: NTIS HC A02/MF A01 CSCL 20/1

This paper discusses a new theory and a computer program for realistic calculation of acoustic pressure signature and spectrum of rotor and propeller noise. Many of the common restrictions of already existing theories are removed by using the new theory which is consistent with all previous theories. Only deterministic pressure fluctuations may be used in the program at this stage of development. This will limit the applicability of the program to relatively high tip speeds where it is known that high frequency unsteady pressure fluctuations do not contribute significantly to the sound level. There are very few blade surface pressure measurements and reliable acoustic data available to test the theory in full. Comparison with the measured acoustic data of a high-speed propeller by Hubbard and Lassiter, using limited aerodynamic data in the blade tip region for acoustic calculations, has shown good agreement so far. One important contribution of the new theory is believed to be the removal of the compactness assumption which can introduce errors in acoustic computations. The new capability will be used to study this effect. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N77-12065*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF UPPER-SURFACE BLOWING AND THRUST VECTORING ON LOW SPEED AERODYNAMIC CHARACTERISTICS OF A LARGE-SCALE SUPERSONIC TRANSPORT MODEL
Paul L. Coe, Jr., H. Clyde McLemore, and James P. Shivers Washington Nov. 1976 85 p refs
(NASA-TN-D-8296; L10979) Avail: NTIS HC A05/MF A01 CSCL 01C

Tests were conducted in a full scale tunnel to determine the low speed aerodynamic characteristics of a large scale arrow wing supersonic transport configured with engines mounted above the wing for upper surface blowing and conventional lower surface engines having provisions for thrust vectoring. Tests were conducted over an angle of attack range of -10 deg to 34 deg and for Reynolds numbers (based on the mean aerodynamic chord) of 5.17 x 1 million and 3.89 x 1 million. A limited number of tests were also conducted for the upper surface engine configuration in the high lift condition at an angle of sideslip of

10 deg in order to evaluate lateral directional characteristics and with the right engine inoperative in order to evaluate the engine out condition. Author

N77-12066*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A PARAMETRIC ANALYSIS OF VISUAL APPROACHES FOR HELICOPTERS
Gene C. Moen, Daniel J. DiCarlo, and Kenneth R. Yenni Washington Dec. 1976 41 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Hampton, Va.
(DA Proj. 1F2-62209-AH-76)
(NASA-TN-D-8275; L-10841) Avail: NTIS HC A03/MF A01 CSCL 17G

A flight investigation was conducted to determine the characteristic shapes of the altitude, ground speed, and deceleration profiles of visual approaches for helicopters. Two hundred thirty-six visual approaches were flown from nine sets of initial conditions with four types of helicopters. Mathematical relationships were developed that describe the characteristic visual deceleration profiles. These mathematical relationships were expanded to develop equations which define the corresponding nominal ground speed, pitch attitude, pitch rate, and pitch acceleration profiles. Results are applicable to improved helicopter handling qualities in terminal area operations. Author

N77-12067# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
FORTRAN PROGRAMS FOR THE DETERMINATION OF AERODYNAMIC DERIVATIVES FROM TRANSIENT LONGITUDINAL OR LATERAL RESPONSES OF AIRCRAFT
A. Jean Ross and G. W. Foster London Aeron. Res. Council 1976 107 p refs Supersedes RAE-TR-75090; ARC-36303 (ARC-CP-1344; RAE-TR-75090; ARC-36303) Avail: NTIS HC A06/MF A01; HMSO £3.30; PHI $12.95

Two FORTRAN computer programs are described, one for the analysis of longitudinal responses of aircraft and one for the analysis of lateral responses in the presence of small longitudinal motion. The aerodynamic derivatives which affect the responses are determined by a Newton-Raphson technique to obtain iteratively the best least-squares fit to the observed data. The numerical method and its implementation in the programs is described, and separate guides for users are provided for the two programs. An example is shown for each program. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N77-12068*# Vought Corp., Dallas, Tex. Systems Div.
DEVELOPMENT OF A SELF CONTAINED HEAT REJECTION MODULE, PHASE 2 AND 3 Final Report
M. L. Fleming 17 Aug. 1976 241 p refs
(Contract NAS9-14408)
(NASA-CR-151109; T211-RP-032) Avail: NTIS HC A11/MF A01 CSCL 14B

The fabrication and testing of a prototype deployable radiator system is described. Vapor compression with a conventional aircraft compressor yielded a net heat rejection effect at high environments while returning low temperature (10 F and 35 F) conditioned fluid to the payload thermal control system. The system is compatible with shuttle orbiter payloads, free flying experiment modules launched from the shuttle, or by another launch vehicle. Author

N77-12069*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADVANCED POROUS TRANSONIC WIND-TUNNEL NOZZLES
Norman E. Sorensen Nov. 1976 21 p refs
(NASA-TM-X-73180; A-6813) Avail: NTIS HC A02/MF A01 CSCL 14B

Advances in the design and control of the porous bleed flow distribution along the nozzle walls solves the problem of nonuniform flow at off-design conditions. This is accomplished in a two dimensional nozzle with porous parallel sidewalls backed with a single plenum chamber and employing a sliding compartment wall or backed with multiple plenum chambers within which the pressure can be controlled. Author

N77-12070*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GENERAL PURPOSE ROCKET FURNACE Patent Application
Billy R. Aldrich and William D. Whitt, inventors (to NASA) Filed 30 Nov. 1976 35 p
(NASA-Case-MFS-23460-1; US-Patent-Appl-SN-746578) Avail: NTIS HC A03/MF A01 CSCL 14B

A multi-purpose furnace for space vehicles used for material processing experiments in an outer space environment. The furnace contains three separate cavities designed to process samples of the widest possible range of materials and thermal requirements. Each cavity contains three heating elements capable of independent function under the direction of an automatic and programmable control system. A heat removable mechanism is also provided for each cavity which operates in conjunction with the control system for establishing an isothermally heated cavity or a wide range of thermal gradients and cool down rates. A monitoring system compatible with the rocket telemetry provides furnace performance and sample growth rate data throughout the processing cycle. NASA

N77-12071*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESIGN FEATURES AND OPERATIONAL CHARACTERISTICS OF THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL
Robert A. Kilgore Washington Dec. 1976 51 p refs
(NASA-TN-D-8304; L-10950) Avail: NTIS HC A04/MF A01 CSCL 14B

Experience with the Langley 0.3 meter transonic cryogenic tunnel, which is fan driven, indicated that such a tunnel presents no unusual design difficulties and is simple to operate. Purging, cooldown, and warmup times were acceptable and were predicted with good accuracy. Cooling with liquid nitrogen was practical over a wide range of operating conditions at power levels required for transonic testing, and good temperature distributions were obtained by using a simple liquid nitrogen injection system. To take full advantage of the unique Reynolds number capabilities of the 0.3 meter transonic tunnel, it was designed to accommodate test sections other than the original, octagonal, three dimensional test section. A 20- by 60-cm two dimensional test section was recently installed and is being calibrated. A two dimensional test section with self-streamlining walls and a test section incorporating a magnetic suspension and balance system are being considered. Author

N77-12072# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
THE FRASCATI (e, e'p) EXPERIMENTAL APPARATUS
G. CamposVenuti, G. P. Capitani (CNEN, Frascati, Italy), G. Cortellessa, E. DeSanctis, G. Farchi, S. Frullani, P. Salvadori, and K. Takamatsu (Inst. for Nucl. Study, Tokyo) 8 Mar. 1975 40 p refs
(ISS-P-75/3) Avail: NTIS HC A03/MF A01

The experimental set-up for the coincidence quasi-free electron scattering measurements carried out at the Frascati Electrosynchrotron is described. Missing energy and momentum distribution of elastic coincidence scattering of hydrogen, used as a calibration of the whole system, are given. Author (ESA)

N77-12073# School of Aerospace Medicine, Brooks AFB, Tex.
OXYGEN ACCUMULATION IN HYPOBARIC CHAMBERS Final Report
Roger L. Stork and Thomas R. Morgan Apr. 1976 7 p refs
(AD-A025860; SAM-TR-14) Avail: NTIS HC A02/MF A01 CSCL 14/2

Chamber oxygen measurements were made on 12 hypobaric chamber flights. These measurements were analyzed to determine whether or not venting the chamber would result in an oxygen accumulation. It was observed that the oxygen percentage increased from the normal value of 20.9% to 27.1%. This seriously compromised the effectiveness of the hypoxia demonstration conducted on these flights. Author (GRA)

N77-12074# Air Force Weapons Lab., Kirtland AFB, N.Mex.
DEVELOPMENT AND APPLICATION OF A LOW COST GAS DYNAMIC LASER TEST FACILITY Final Report
Roger A. Tennant, R. Vargas, Gerald S. Knoke, and P. J. Ortwerth Mar. 1976 76 p refs
(AF Proj. 3326)
(AD-A025648; AFWL-TR-75-268) Avail: NTIS HC A05/MF A01 CSCL 20/5

This report describes the design, instrumentation and operation of two intermittent facilities for Gas Dynamic Laser research. Intermittent facilities have the attractive characteristics of very low cost, configuration flexibility, and ease of conducting tests with a large dynamic range of initial conditions. The kinetics of vibrational freezing in gas dynamic laser nozzles was studied. Small signal gain, static temperature, pressure and Mach number were measured downstream of the nozzle exit. Results for different mixtures, total temperatures, and area ratio changes are presented. Results of a research program to study the effects of contraction ratio, length, and wedge angle on the performance of a vane diffuser are presented. The effects of promoting early boundary layer transition are shown to be important in vane diffusers. A separate study was performed to determine the effects of impulsive starting vane diffusers compared with quasi-steady starting. The results conclusively show no change of start or unstart performance due to impulsive operation. GRA

N77-12075# Franklin Inst. Research Labs., Philadelphia, Pa.
DESIGN STUDIES OF A MOTION SYSTEM FOR THE VTOL SIMULATION FACILITY Final Report, Aug. 1975 - Mar. 1976
Charles A. Belsterling and Edward I. Mucha Feb. 1976 222 p refs
(Contract N61339-76-C-0007)
(AD-A024732; FIRL-F-C4270-01;
NAVTRAEQUIPC-76-C-0007-1) Avail: NTIS HC A10/MF A01 CSCL 01/2

This report documents the design studies involved in determining the best configuration for a new integrated display and motion system for the Naval Training Equipment Center VTOL Simulation Facility. Four candidate schemes are considered, and two are chosen for detailed comparison. The result is the recommendation for a new six-degree-of-freedom suspended from a low-profile foundation structure. Author (GRA)

N77-12076# ARO, Inc., Arnold Air Force Station, Tenn.
A MATHEMATICAL MODEL FOR THE STARTING PROCESS Final Report, Jul. 1974 - Apr. 1975
Frederick L. Shope AEDC Jun. 1976 132 p refs
(ARO Proj. V37A-32A)
(AD-A025692; ARO-VKF-TR-75-147; AEDC-TR-76-39) Avail: NTIS HC A07/MF A01 CSCL 14/2

A simplified mathematical model is presented for the unsteady flow process of starting a transonic Ludwieg tube wind tunnel. The hardware modeled consists of a porous-walled test section surrounded by a plenum chamber with an exhaust system independent of the tunnel's main starting valves, which are located downstream of the diffuser-test section. In the present method, the hardware is modeled as three control volumes: the plenum, the test section, and the diffuser. The plenum is treated with the unsteady integral continuity equation with one-dimensional influx or outflux through the porous wall, through the plenum exhaust system, and through the flaps, which exhaust into the diffuser. The other two control volumes are treated with the steady integral continuity equation and a steady, adiabatic, one-dimensional energy equation whose stagnation conditions vary in time according to the classical solution for an unsteady expansion wave. Numerical solutions are compared with experimental pressure-time histories of a small, transonic, high Reynolds number tunnel referred to as HIRT. Agreement between the model and experiment is good. Author (GRA)

N77-12077# Clarkson Coll. of Technology, Potsdam, N.Y.
CUMULATIVE DEFLECTION AND RIGID PAVEMENT SERVICEABILITY Final Report, Jul. 1974 - Sep. 1975
William H. Highter Nov. 1975 63 p refs
(Contract F29601-75-C-0002; AF Proj. 2104)
(AD-A024969; AFCEC-TR-75-20) Avail: NTIS HC A04/MF A01 CSCL 01/5

This report describes efforts to relate the energy imparted to a rigid pavement system, as measured by cumulative deflections to the condition of that system. Analysis of raw data from the American Association of State Highway Officials Road Test showed no results that could be used for predictive purposes. Use of average data points indicated there exists a threshold cumulative deflection beyond which pavement serviceability changes rapidly. Author (GRA)

N77-12078# McDonnell Aircraft Co., St. Louis, Mo.
WIND TUNNEL MODELS FOR AERO-OPTICAL INTERACTION STUDY Final Report
B. A. Weber Apr. 1976 7 p
(Contract F29601-75-C-0040; AF Proj. 3326)
(AD-A024925; AFWL-TR-75-219) Avail: NTIS HC A02/MF A01 CSCL 14/2

McDonnell Aircraft Company (MCAIR) has designed and fabricated wind tunnel models and provided technical support for an Air Force Weapons Laboratory/National Aeronautics and Space Administration (AFWL/NASA) aero-optical interaction study. In accordance with the conditions of the contract, this final report consists only of a brief description of the models. Author

N77-12079# Cushing Engineering, Inc., Northbrook, Ill.
EXPLODING WIRE SHOCK TEST FACILITY Final Report
Richard A. Boardman 15 Apr. 1976 34 p refs Prepared in cooperation with Sharp (George G.), Inc., New York
(Contract N00014-73-C-0402)
(AD-A024924) Avail: NTIS HC A03/MF A01 CSCL 14/2

A shock test facility has recently been assembled and demonstrated for the purpose of investigating and testing underwater explosion phenomena from a pure energy yield explosion source. In conjunction with these experiments, formulas were developed to accurately scale data results from these tests to approximate large nuclear explosions. The attendant instrumentation for this facility, presently available, allows for the study of gas bubbledynamics, surface wave and shock wave propagation, rarefaction shock wave generated cavitation and column formation. The test facility equipment is described in regard to its construction, alignment and operational sequence. GRA

N77-11970# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
DIGITAL COMPUTER ASPECTS OF THE INSTRUMENTATION AND CONTROL OF THE NEW RAE 5 METRE LOW SPEED TUNNEL
R. J. North, R. W. Jeffery, J. A. Dolman, and A. N. Tuck *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 10 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11971# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Centre de Modan Avrieux.
OPERATIONAL USE OF COMPUTERS ASSOCIATED WITH THE MODANE WIND TUNNELS
Gerard Grenat *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 9 p refs In FRENCH; ENGLISH summary (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATIONS OF THE REAL-TIME DATA ANALYSIS SYSTEM IN THE AMES 40- BY 80-FOOT WIND TUNNEL
Mark W. Kelly, Stanley O. Dickinson, and Everett E. Maynard *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 10 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01 CSCL 14B

N77-11974# Arizona Univ., Tucson.
SOME EXPERIENCES WITH THE EXPLOITATION OF MEASUREMENTS OF THE PERTURBATION FIELD IN A WIND TUNNEL TO IMPROVE SIMULATION
W. R. Sears *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 4 p Prepared in cooperation with Calspan Corp. (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11975# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
APPLICATION OF THE COMPUTER FOR ON-SITE DEFINITION AND CONTROL OF WIND TUNNEL SHAPE FOR MINIMUM BOUNDARY INTERFERENCE
M. Judd, M. J. Goodyer, and S. W. D. Wolf *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 14 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11976# Avions Marcel Dassault, Saint-Cloud (France).
ADAPTATION OF THE JOPPA METHOD TO A WIND TUNNEL WITH VARIABLE PERMEABILITY [ADAPTATION DE LA METHODE DE JOPPA A UNE SOUFFLERIE A PERMEABILITE VARIABLE]
Jean-Ch. Vayssaire, M. Langot (Institut Aerotechnique de Saint-Cyr), and M. Menard (Institut Aerotechnique de Saint-Cyr) *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 17 p refs In FRENCH (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11977# ARO, Inc., Arnold Air Force Station, Tenn.
AUTOMATIC CONTROL OF A TRANSONIC WIND TUNNEL WITH A REAL-TIME COMPUTER SYSTEM
J. A. Gunn and J. P. Christopher, Jr. *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 6 p ref (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11978# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MINIMIZING WALL INTERFERENCE IN CONNECTIONAL TRANSONIC TEST SECTIONS BY USING COMPUTER PARAMETRIC STUDIES
Xavier Vaucheret *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 23 p refs In FRENCH; ENGLISH summary (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11981# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
THEORETICAL AND EXPERIMENTAL SIMULATION METHODS FOR EXTERNAL STORE SEPARATION TRAJECTORIES
J. VonDerDecken, P. Esch, and P. Fritz *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 5 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

N77-11984# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
NUMERICAL SIMULATION OF THREE DIMENSIONAL TRANSONIC FLOW INCLUDING WIND TUNNEL WALL EFFECTS
W. Schmidt, H.-W. Stock, and W. Fritz *In* AGARD Numerical Methods and Windtunnel Testing Oct. 1976 8 p refs (For primary document see N77-11969 03-01)
Avail: NTIS HC A10/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N77-12080*# Kanner (Leo) Associates, Redwood City, Calif.
F. A. TSANDER AND MODERN COSMONAUTICS
Yu. S. Voronkov, ed., G. G. Gakhun, ed., L. S. Dushkin, ed., I. A. Merkulov, ed., Ye. K. Moshkin, ed., S. V. Raushenbakh, ed., V. N. Sokolskiy, ed., and Ye. S. Shchetinkov, ed. Washington NASA Aug. 1976 316 p refs Transl. into ENGLISH of the book "F. A. Tsander i Sovremennaya Kosmonavtika" Moscow, Nauka Press, 1976 p 1-206
(Contract NASw-2790)
(NASA-TT-F-17096) Avail: NTIS HC A14/MF A01 CSCL 22A

The development of the ideas of F. A. Tsander and their realization in modern astronautics are traced in such areas as astrodynamics, the theory and design of motors and space vehicles, life support systems and astrobotanics. Considerable attention is given to analysis of the role and significance of the works of F. A. Tsander in the history of rocket and space science and technology. Author

N77-12081*# Scientific Translation Service, Santa Barbara, Calif.
COMPARATIVE ANALYSIS OF DESIGNS AND IMPLEMENTATIONS OF REACTION FLYING VEHICLES PROPOSED DURING THE NINETEENTH AND BEGINNING OF THE TWENTIETH CENTURIES
V. N. Sokolskiy Washington NASA Dec. 1976 37 p refs Transl. into ENGLISH of conf. paper from Acad. Sci. USSR, Moscow Presented at the 10th Hist. Symp. of the Intern. Acad. of Astronautics, Anaheim, Calif., 15 Oct. 1976 p 1-27 Prepared for JPL
(Contract NAS7-100)
(NASA-TT-F-16749) Avail: NTIS HC A03/MF A01 CSCL 22A

Investigation is made as to what extent ideas and proposals expressed during the 19th and beginning of the 20th centuries were realized in the first implementations in rocket technology. S.M.

N77-12082*# Scientific Translation Service, Santa Barbara, Calif.
ENTRANCE OF MANKIND INTO SPACE (15TH ANNIVERSARY OF THE FIRST MANNED FLIGHT INTO SPACE)
G. A. Skuridin, V. I. Sevast'yanov, and G. A. Nazarov Washington NASA Aug. 1976 56 p Transl. into ENGLISH of the booklet "Vykhodchelovechestva v kosmos (15 let so vremeni pervovo poleta cheloveka v kosmos)" (Novoyev zhini, Nauke, Tekhnike, seriya kosmonavtika, astronomiya, no. 5, 1976), Zhaniye Press, Moscow, 1976 p 1-54
(Contract NASw-2791)
(NASA-TT-F-17114) Avail: NTIS HC A04/MF A01 CSCL 22A

The stages in the development of the idea of manned flight into space are traced along with the evolution of the profession of cosmonauts who have become spacecraft test pilots and also research scientists solving many scientific, national, and economic problems. Author

N77-12083*# Rockwell International Corp., El Segundo, Calif. Space Div.
MANUFACTURING UNIQUE GLASSES IN SPACE Interim Report, 1 Nov. 1974 - 31 Mar. 1976
Ralph P. Happe 31 Mar. 1976 42 p refs
(Contract NAS8-28991)
(NASA-CR-150067; SD-76-SA-0029; IR-2) Avail: NTIS HC A03/MF A01 CSCL 11D

An air suspension melting technique is described for making glasses from substances which to date have been observed only in the crystalline condition. A laminar flow vertical wind tunnel was constructed for suspending oxide melts that were melted using the energy from a carbon dioxide laser beam. By this method it is possible to melt many high-melting-point materials without interaction between the melt and crucible material. In addition, space melting permits cooling to suppress crystal growth. If a sufficient amount of under cooling is accompanied by a sufficient increase in viscosity, crystallization will be avoided entirely and glass will result. Author

N77-12084*# Owens-Illinois, Inc., Toledo, Ohio. Materials Research Section.
PROCESSING FeB03 GLASS-CERAMICS IN SPACE Annual Report, 25 Jun. 1975 - 30 Sep. 1976

C. T. Li 15 Oct. 1976 50 p
(Contract NAS8-31381)
(NASA-CR-150068) Avail: NTIS HC A03/MF A01 CSCL 11B

The possibility of preparing FeBO3 glass-ceramic in space is explored. A transparent glass-ceramic of FeBO3, due to its unique properties could be an excellent material for magneto-optic applications which currently utilize high price materials such as single crystals of Ga-YIG. The unique magneto-optic properties of FeBO3 were found to come from glass-ceramic but not from the glass form. It was anticipated and later confirmed that the FeBO3 glass-ceramics could not be prepared on earth. Phase separation and iron valence reduction, were identified as the two terrestrial manufacturing obstacles. Since the phase separation problem could be overcome by space processing, the preparation of FeBO3 glass-ceramic in space appears attractive. Author

N77-12085# Academy of Sciences (USSR), Moscow. Space Research Inst.
SOME RESULTS OF STUDIES IN SPACE TECHNOLOGY IN THE USSR
A. S. Okhotin, V. F. Laptchinsky, and G. S. Shonin 1976 13 p refs
(D-240) Avail: NTIS HC A02/MF A01

Main trends in this area and experimental results of welding in weightlessness, development of welded spacecraft (micro) atmosphere and of its impact of technological extravehicular processes, and the impact of controlled external disturbances of the crystallization of multiphase media and eutectic alloys under various gravitational conditions, are discussed. Prospects are outlined for scientific studies in space technology. Author (ESA)

N77-12086# Centre National d'Etudes Spatiales, Paris (France).
FRENCH SPACE PROGRAM. REPORT TO COSPAR [PROGRAMME SPATIAL FRANCAIS. RAPPORT AU COSPAR]
1976 127 p refs In FRENCH Presented at the 19th COSPAR Assembly, Philadelphia, Jun. 1976
Avail: NTIS HC A07/MF A01

A report is presented on French space activities over the period mid-1975 to mid-1976. These activities cover the following main fields: extrasolar system astronomy, solar physics, solar system, lunar rocks, ionospheric and magnetospheric physics, aeronomy, meteorology, earth resources, geodesy and geodynamics, biology and space medicine. ESA

N77-12087# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
SOLAR OUT-OF-ECLIPTIC STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
T. G. Chambers and E. P. L. Windsor Apr. 1976 82 p Prepared jointly with Thomson-CSF, Paris 5 Vol.
(Contract ESA-SC/88-HQ)
(ESS/SS-699-Vol-1; ESA-CR(P)-837-Vol-1) Avail: NTIS HC A05/MF A01

A preliminary, but complete, technical definition is provided of the spacecraft which forms ESA's contribution to a joint ESA/NASA Jupiter swingby out-of-ecliptic mission as far as the subsystems level. The establishment of a development program and the evaluation of the facilities required were also studied. The mission profile is: baseline ESA spacecraft plus auxiliary propulsion unit launch using Atlas Centaur/TEM 364-4 onto an indirect transfer to Jupiter. It is concluded that an ESA spacecraft could be designed which would carry the specified model payload to a high solar latitude and that the development program could be undertaken within the cost bracket specified. A January 1982 launch opportunity could be achieved. ESA

N77-12088# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
SOLAR OUT-OF-ECLIPTIC STUDY. VOLUME 2: SYSTEM ANALYSIS AND DEFINITION Final Report
T. G. Chambers and E. P. L. Windsor Apr. 1976 365 p Prepared jointly with Thomson-CSF, Paris 5 Vol.
(Contract ESA-SC/88-HQ)
(ESS/SS-699-Vol-2; ESA-CR(P)-837-Vol-2) Avail: NTIS HC A16/MF A01

An analysis and definition at system level is presented for the spacecraft which forms ESA's contribution to a joint ESA/NASA Jupiter swingby out-of-ecliptic mission. Aspects considered are: scientific objectives and payloads, launch vehicle interface, ground station interface, spacecraft operations, cleanliness, and reliability. An analysis is given of the mission, and the system is defined in detail. ESA

N77-12089# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
SOLAR OUT-OF-ECLIPTIC STUDY. VOLUME 3: SUBSYSTEM ANALYSIS AND DEFINITION Final Report
T. G. Chambers and E. P. L. Windsor Apr. 1976 219 p Prepared jointly with Thomson-CSF, Paris 5 Vol.
(Contract ESA-SC/88-HQ)
(ESS/SS-699-Vol-3; ESA-CR(P)-837-Vol-3) Avail: NTIS HC A10/MF A01

An analysis and definition at subsystem level is presented for the spacecraft which forms ESA's contribution to a joint ESA/NASA Jupiter swingby out-of-ecliptic mission. Subsystems considered are: telecommunications data handling, power supply, attitude and orbit control, thermal control, structure, and booms. A reliability and safety analysis is included. ESA

N77-12090# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
SOLAR OUT-OF-ECLIPTIC STUDY: VOLUME 4: DEVELOPMENT PLAN AND COST ESTIMATES Final Report
T. G. Chambers and E. P. L. Windsor Apr. 1976 76 p Prepared jointly with Thomson-CSF, Paris 5 Vol.
(Contract ESA-SC/88-HQ)
(ESS/SS-699-Vol-4; ESA-CR(P)-837-Vol-4) Avail: NTIS HC A05/MF A01

Development plans and cost estimates are presented for the spacecraft which forms ESA's contribution to a joint ESA/NASA Jupiter swingby out-of-ecliptic mission. A combination of protoflight model philosophy and maximized use of existing hardware are central elements in the achievement of a ceiling price level. Cost estimates for two different payloads fall below the ceiling. The margin between estimated costs and ceiling is found to be inadequate for an average expectation of development problems. A number of potential avenues for significant further cost reductions have been identified. ESA

N77-12091# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
SOLAR OUT-OF-ECLIPTIC STUDY. APPENDIX: SYSTEM SPECIFICATION Final Report
C. A. Price and T. G. Chambers May 1976 43 p Prepared jointly with Thomson-CSF, Paris 5 Vol.
(Contract ESA-SC/88-HQ)
(ESS/SS-699-App; ESA-CR(P)-837-App) Avail: NTIS HC A03/MF A01

A system specification is presented for the spacecraft which forms ESA's contribution to a joint ESA/NASA Jupiter swingby out-of-ecliptic mission. The overall performance requirements are defined in terms of the primary performance requirements of the envisaged system and individual subsystems; launcher options and their performance capabilities; associated ground facilities in the time frame of interest; and other constraints as identified to date. ESA

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N77-12092*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE THEORY OF THE GRAVITATIONAL POTENTIAL APPLIED TO ORBIT PREDICTION
James C. Kirkpatrick Oct. 1976 82 p refs
(NASA-TM-X-58186; JSC-10936) Avail: NTIS HC A05/MF A01 CSCL 22A

A complete derivation of the geopotential function and its gradient is presented. Also included is the transformation of Laplace's equation from Cartesian to spherical coordinates. The

analytic solution to Laplace's equation is obtained from the transformed version, in the classical manner of separating the variables. A cursory introduction to the method devised by Pines, using direction cosines to express the orientation of a point in space, is presented together with sample computer program listings for computing the geopotential function and the components of its gradient. The use of the geopotential function is illustrated. Author

N77-12093# Analytical and Computational Mathematics, Zurich (Switzerland).
APPLICATION OF THE MULTIREVOLUTION ORBIT PREDICTION METHOD
O. Graf Jul. 1976 66 p refs
(Contract ESOC-753/75-T)
(ESA-CR(P)-840) Avail: NTIS HC A04/MF A01

A general multirevolution algorithm that can be used with any element set and is adaptable to any orbit computation software system was developed. Of special interest is its use on orbits perturbed by a massive body that lies external to the satellite orbit. The theoretical background is discussed and details of the computer program are given. Numerical experiments on three types of satellite orbits, a geosynchronous orbit, an elliptical orbit and a HEOS-type orbit, are presented. ESA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N77-12094*# Scientific Translation Service, Santa Barbara, Calif.
USE AND ANALYSIS OF THE SCIENTIFIC DATA FROM THE INTASAT SATELLITE
Jose Luis Sagredo Ruiz Washington NASA Jul. 1976 51 p ref Transl. into ENGLISH of "Informe no. I-800-6-75", Inst. Nacl. de Tecnica Aerospacial, Terrejon de Ardoz, Spain, 18 Dec. 1975 p 1-56
(Contract NASw-2791)
(NASA-TT-F-16738) Avail: NTIS HC A04/MF A01 CSCL 05B

The interest in the ionospheric studies is described, and the usefulness of the results obtained so far with the INTASAT satellite is evaluated. The most important characteristics of the satellite and the scientific experiments as well as the international participation in the program are presented. The theory the scientific experiment is based on is described, and a detailed study of the methods for obtaining the ionospheric parameters from the recorded data is given. A method is described for determining unequivocally the profiles for the content of free electrons in the ionosphere, and the physical interpretation of them. The recording and analysis programs and the work program for 1976 are shown. Author

N77-12095*# Kanner (Leo) Associates, Redwood City, Calif.
REPORT ON ONE YEAR'S FLIGHT: INTASAT SATELLITE PROJECT
G. A. Santullano Washington NASA Jul. 1976 68 p Transl. into ENGLISH from the Spanish report
(Contract NASw-2790)
(NASA-TT-F-16739) Avail: NTIS HC A04/MF A01 CSCL 05B

Missions of the Spanish INTASAT Satellite are described. The first mission is designed to study certain characteristics of the ionosphere. The second mission is designed to study the behavior of electronic units in space. All subsystems of the satellite are reported as behaving properly from the time of insertion in orbit, and throughout the first year in orbit. Author

N77-12096*# Scientific Translation Service, Santa Barbara, Calif.
GENERAL OPERATIONS PROGRAM SIGNE 3
B. Lago Washington NASA Sep. 1976 28 p refs Transl. into ENGLISH of French Report Rept-76/DEXO/OPS/SP/207, 6 Jul. 1976 p 1-30
(Contract NASw-2791)
(NASA-TT-F-16760) Avail: NTIS HC A03/MF A01 CSCL 22B

Planned operational phases linked to the SIGNE 3 satellite, together the structural design and telemetric equipment, are described. The satellite is to be launched by the USSR; thereafter the responsibilities will be assumed by French experts monitoring orbital flight, and starting and controlling experiments. A brief summary of the mission's objective is first given, then the system resources, i.e., satellite and ground resources are succinctly described. Author

N77-12097*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ORBITER DESCRIPTION DOCUMENT FOR JUPITER ORBITER PROBE 1981/1982 MISSION
Sep. 1976 188 p ref
(NASA-CR-149244; JPL-660-22) Avail: NTIS HC A09/MF A01 CSCL 22B

The Jupiter Orbiter as it is presently understood is documented. Because the Jupiter Orbiter Probe 1981/1982 (JOP 81/82) Project will be severely cost constrained, the Orbiter design and capabilities described herein are not subject to major change or modification as a result of instrument selection. The JOP science payload should conform to this defined capability and the specified interfaces. A description and discussion of any science instrument complement is excluded, except the imaging science subsystem and the radio science capability which are provided by the project as Orbiter facilities. The environmental design requirements and the mission operations description are studied. This document has been prepared specifically for the JOP Announcement of Opportunity proposal preparation package and describes the Jupiter Orbiter in sufficient detail to allow the science community to propose scientific instrumentation consistent with its capabilities and limitations. Author

N77-12098# Ball Bros. Research Corp., Boulder, Colo.
AUTOMATIC MAGNETIC CONTROL OF A MOMENTUM-BIASED OBSERVATORY IN EQUATORIAL ORBIT
T. M. Spencer 26 Apr. 1976 26 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Rockets and Spacecraft in Apr. 1977
Avail: NTIS HC A03/MF A01

An equatorial astronomical observatory is stabilized by electromagnets and a single axial momentum wheel. Pointing and wheel speed errors combined with magnetometer outputs drive the magnets. Proportional laws and momentum dumping laws (gains quadratically weighted using magnetometer outputs) are compared. A new open-loop law uses the magnetometer alone to generate efficient slews and wheel dumps. Modified three axis dumping laws provide sub-degree pointing. Simple proportional laws provide arc minute pointing with occasional wheel dump interruptions and possible pointing excursions of a few arc minutes. The new proportional approach offers momentum control advantages for this and other missions. Author

N77-12099*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PURGING OF A MULTILAYER INSULATION WITH DACRON TUFT SPACER BY GAS DIFFUSION
Irving E. Sumner and William J. Fisk Washington Dec. 1976 28 p refs
(NASA-TM-X-3456; E-8833) Avail: NTIS HC A03/MF A01 CSCL 11D

The time and purge gas usage required to purge a multilayer insulation (MLI) panel with gaseous helium by means of gas diffusion to obtain a condensable gas (nitrogen) concentration of less than 1 percent within the panel are stipulated. Two different, flat, rectangular MLI panels, one incorporating a butt joint, were constructed of of 11 double-aluminized Mylar (DAM) radiation shields separated by Dacron tuft spacers. The DAM/Dacron tuft concept is known commercially as Superfloc. The nitrogen gas concentration as a function of time within the MLI panel could be adequately predicted by using a simple, one dimensional gas diffusion model in which the boundary conditions at the edge of the MLI panel were time dependent. The time and purge gas usage required to achieve 1 percent nitrogen gas concentration within the MLI panel varied from 208 to 86 minutes and 34.1 to 56.5 MLI panel purge volumes, respectively, for gaseous helium purge rates from 10 to 40 MLI panel volumes per hour. Author

N77-12100# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
PASSIVE ATTITUDE STABILIZATION OF SATELLITES [PASSIEVE STANDSTABILISATIE VAN SATELLIETEN]
E. Slaghmuylders and P. P. vandenBroek 1975 117 p refs In DUTCH
(VTH-176) Avail: NTIS HC A06/MF A01

The origin of perturbing torques acting upon a satellite is discussed. The most used passive methods for satellite attitude control, namely magnetic and gravity gradient stabilization, are dealt with. Means for producing a correction torque and different methods for motion damping are reviewed. ESA

N77-12101# Old Dominion Systems, Inc., Gaithersburg, Md.
ENVIRONMENTAL POSITION ERRORS OF THE GPS. ARMY USER EQUIPMENT
F. M. Loveless May 1976 46 p
(Contract DAAG53-76-F-0559)
(AD-A025940; ETL-0055) Avail: NTIS HC A03/MF A01 CSCL 17/7

The effect of masking angle, multipathing, foliage penetration and signal strength on the determination of GPS - Army User Equipment locations was determined. A computer program to simulate the scenario functions was written and was used to perturb range measurements from 10 user locations to six GPS satellites (initial deployment configuration). Tracking times of 20 minutes, 2 hours, and 7 hours were investigated to determine the affect of the solution of a user's position. Various magnitudes of the scenario functions were also considered. The results indicate that GPS user equipment operating in a typical Army environment will not be able to recover the user's position to better than 3 meters even if the only source of error was due to the scenario functions. The magnitude of the error due to scenario functions produces almost a one-to-one error in the determination of the user's location. Author (GRA)

N77-12102# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Guidance and Control Directorate.
SIMULATION MODELS AND BASELINE GUIDANCE AND CONTROL FOR INDIRECT-FIRE MISSILES WITH STRAPDOWN-INERTIAL GUIDANCE
Walter E. Jordan Jan. 1976 124 p refs
(DA Proj. 1W3-62303-A-214)
(AD-A024977; RG-76-41) Avail: NTIS HC A06/MF A01 CSCL 16/2

The simulation models and baseline guidance and control described in this report were developed to define performance requirements for the airframe, propulsion, guidance, autopilot, and control systems for strapdown-inertially guided indirect-fire missiles. A type of proportional navigation guidance using missile to target relative velocity and position is derived and has the property of being able to shape the missile trajectory for range extension and instrument error minimization. Typical inputs for inertial instruments and control system performance and sizing are obtained. Author (GRA)

N77-12103# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab Section.
MINUTEMAN STAGE 3 COMPONENT REPORT Semiannual Test Results
Elizabeth M. Dalaba Mar. 1976 53 p
(AD-A025093; MANCP-336(76)) Avail: NTIS HC A04/MF A01 CSCL 16/4

This report contains the results of 1975 testing on LGM-30 Stage III Wing VI unique (OPRI) specimens. Testing was accomplished in accordance with MMEMP GID-30, Amend 1 by authority of Project M62419 M, DO 12-097 P. Case bond tensile tests were not conducted at this test period due to insufficient specimens available for testing. Average peel strength for System 22 shows a significant increase. There are significant trends in the adhesive and potting compounds. Peel specimens in general are not producing data relative to the adhesive, but rather to the Buna-S insulator. Spiralloy layer lap shear shows a significant increase in lap shear strength. Since there are no failure criteria for adhesives, service life estimates can not be made. The limited number of specimens available using Epon 923.2 place constraints on extensive testing and analysis. Author (GRA)

N77-12104# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Guidance and Control Directorate.
SAM-D TRADE-OFF STUDY, ELECTROMECHANICAL CONTROL ACTUATION SYSTEM (EM/CAS)
Joe L. Byrd 2 Feb. 1976 39 p
(DA Proj. 1X3-64307-D-212)
(AD-A025232; RG-76-55) Avail: NTIS HC A03/MF A01 CSCL 16/4

This report presents a discussion of the application of an electromechanical type actuator to the SAM-D missile. An actuator was not designed, but the preliminary design parameters and component sizes were estimated. The basic conclusion is that a conventional electromechanical actuator using magnetic particle clutches will not fit into the available volume on the SAM-D vehicle. Author (GRA)

N77-12105# Aerospace Corp., El Segundo, Calif. Satellite Systems Div.
ON-ORBIT AND IN-PLANT SATELLITE STORAGE Final Report
Roy Hammerand 19 May 1976 28 p refs
(Contract F04701-75-C-0076)
(AD-A025902; TR-0076(6793)-1; SAMSO-TR-76-111) Avail: NTIS HC A03/MF A01 CSCL 22/2

The increasing need to maintain uninterrupted military communications service and the economies inherent in batch satellite buys have forced programs to decide on a mode of storage for those satellites not immediately needed for the on-orbit operational system. The experience of on-going satellite programs is reviewed to determine the relative benefits of on-orbit versus on-the-ground (in-plant) storage. Design factors that must be considered for storage on orbit are addressed and show that the impact on satellite design is small. Data on the operability of units (black boxes) that were turned on after years of on-orbit dormancy indicated very low on-orbit dormancy failure rates. GRA

N77-12106# Advanced Technology Labs., Inc., Westbury, N.Y.
IGNITION PHASE BLAST FIELD OF TUBE OR SILO LAUNCHED ROCKETS: INVISCID, CHEMICALLY REACTING FLOW MODEL Final Report, 15 Jan. 1974 - 14 Jan. 1976
John Erdos and John Ranlet Apr. 1976 55 p refs
(Contract F44620-74-C-0041; AF Proj. 9711)
(AD-A025198; ATL-TR-229; AFOSR-76-0540TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

An inviscid, unsteady, chemically reacting flow model has been developed which illustrates the principal features of the blast field generated by ignition of a rocket motor in immediate proximity of the ground or sea surface. The system of governing equations and solution algorithm are outlined, and several numerical examples are discussed. An asymptotic solution to the flow field produced by the blast wave is discussed and compared with the present numerical solutions. Correlation of the asymptotic solutions for various time steps and for various sources of high pressure propellant gases is demonstrated.

Extension of the model to include turbulent mixing and more complete chemical kinetics is recommended. Author (GRA)

N77-12107# Raytheon Co., Waltham, Mass. Laser Advanced Development Center.
DEVELOPMENT AND FABRICATION OF A SPACE HARDENED Nd(+3) YAG LASER TRANSMITTER SYSTEM FOR ORBITAL RANGE AND ALTITUDE CONTROL Final Report, 1 Jan. 1973 - May 1975
Lorand J. Wargo 6 May 1975 131 p
(Contract N00014-73-C-0199)
(AD-A025155) Avail: NTIS HC A07/MF A01 CSCL 20/5

During the program, research and development was conducted for space hardening the Raytheon SS-219 miniature Nd(+3) YAG system, to be able to operate in a ground launched satellite. Study was conducted to identify and eliminate all sources of laser degradation resulting from the space environment with special consideration of the radiation conditions as they exist at an altitude of 666 nautical miles and the shock and vibrational environment (mechanical and acoustical) encountered during the launch period. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N77-12108*# Chrysler Corp., New Orleans, La. Space Div.
TRANSONIC STABILITY AND CONTROL CHARACTERISTICS OF A 0.015 SCALE MODEL 69-0 OF THE SPACE SHUTTLE ORBITER WITH FOREBODY RSI MODIFICATION IN THE NASA/LaRC 8 FOOT TPT (LA72)
J. W. Ball and C. R. Edwards Oct. 1976 155 p
(Contract NAS9-13247)
(NASA-CR-147644; DMS-DR-2309) Avail: NTIS HC A08/MF A01 CSCL 01A

Tests were conducted in the NASA/LaRC 8 foot transonic wind tunnel from March 26 through 31, 1976. The model was a 0.015 scale SSV Orbiter with forebody modifications to simulate slight reductions in the reusable surface insulation (RSI) thickness. Six component aerodynamic force and moment data were obtained at Mach numbers from 0.35 to 1.20 over an angle of attack range from -2 deg to 20 deg at sideslip angles of 0 deg and 5 deg. Author

N77-12109*# Chrysler Corp., New Orleans, La. Space Div.
HIGH SUPERSONIC STABILITY AND CONTROL CHARACTERISTICS OF A 0.015-SCALE (REMOTELY CONTROLLED ELEVON) MODEL 44-0 SPACE SHUTTLE ORBITER TESTED IN THE NASA/LaRC 4-FOOT UPWT (LEG 2) (LA75), VOLUME 1
J. W. Ball Nov. 1976 686 p
(Contract NAS9-13247)
(NASA-CR-147646; DMS-DR-2318-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 01A

Wind tunnel tests are reported on a 0.015-scale SSV orbiter model with remote independently operated left and right elevon surfaces. Special attention was directed to definition of nonlinear aerodynamic characteristics by taking data at small increments. Six component aerodynamic force and moment and elevon position data were recorded for the space shuttle orbiter with various elevon, aileron rudder and speed brake deflection combinations over an angle of attack range from -4 deg to 32 deg at angles of sideslip of 0 deg and 3 deg. Additional tests were made over an angle of sideslip range from -6 deg to 8 deg at selected angles of attack. Test Mach numbers were 2.86, 2.90, 3.90 and 4.60 with Reynolds numbers held at a constant 2.0 x 1 million per foot. Author

N77-12110*# Chrysler Corp., New Orleans, La. Space Div.
HIGH SUPERSONIC STABILITY AND CONTROL CHARACTERISTICS OF A 0.015-SCALE (REMOTELY CONTROLLED ELEVON) MODEL 44-0 SPACE SHUTTLE ORBITER TESTED IN THE NASA/LaRC 4-FOOT UPWT (LEG 2) (LA75), VOLUME 2
J. W. Ball Nov. 1976 575 p
(Contract NAS9-13247)
(NASA-CR-147647; DMS-DR-2318-Vol-2) Avail: NTIS HC A24/MF A01 CSCL 01A

For abstract, see N77-12109.

N77-12111*# Chrysler Corp., New Orleans, La. Space Div.
A LOW SPEED WIND TUNNEL TEST OF A 0.050 SCALE MODEL OF SHUTTLE ORBITER (MODEL 089B) TO INVESTIGATE THE LONGITUDINAL AND LATERAL DIRECTIONAL EFFECTS OF CANARD AND TAIL CONFIGURATIONAL MODIFICATIONS IN THE LTV LSWT (MA14)
E. B. Chambliss (Johnson Space Center) Oct. 1976 248 p refs
(Contract NAS9-13247)
(NASA-CR-147649; DMS-DR-2283) Avail: NTIS HC A11/MF A01 CSCL 01A

A low speed wind tunnel test was conducted to determine the effects of 6 canard configurations on the 0.050 scale model of shuttle orbiter 089B. In addition, two horizontal tail configurations were tested at two positions on the model as were two wing configurations. Since this test was restricted to 103 runs, only a limited number of permutations of the configurational changes could be tested. The testing was done in the 15 by 20 foot section of the LSWT and consisted of pitch polars, one yawed polar and several yaw runs. The pitch polars encompassed an alpha range from 0 to 28 deg; the yawed polar was run at beta = +2 degrees and the yaw runs covered a beta range from -6 to +6 deg at angles-of-attack of 0, 4, 10, 16, and 20 deg. Author

N77-12112*# Analytic Sciences Corp., Reading, Mass.
SPACE SHUTTLE NAVIGATION ANALYSIS
Harold L. Jones, Gerd Luders, Gary A. Matchett, and James E. Sciabarrasi 10 Sep. 1976 230 p refs
(Contract NAS9-14203)
(NASA-CR-151113; TR-548-2) Avail: NTIS HC A11/MF A01 CSCL 22A

A detailed analysis of space shuttle navigation for each of the major mission phases is presented. A covariance analysis program for prelaunch IMU calibration and alignment for the orbital flight tests (OFT) is described, and a partial error budget is presented. The ascent, orbital operations and deorbit maneuver study considered GPS-aided inertial navigation in the Phase III GPS (1984+) time frame. The entry and landing study evaluated navigation performance for the OFT baseline system. Detailed error budgets and sensitivity analyses are provided for both the ascent and entry studies. Author

N77-12113*# Martin Marietta Corp., Denver, Colo.
ANALYTICAL STUDY OF LIGHTWEIGHT ACOUSTIC SHROUDS FOR SHUTTLE EXPERIMENTS AND PAYLOADS Final Report
John Baratono and Paul Rader Oct. 1976 118 p ref
(Contract NAS8-31912)
(NASA-CR-150116; MCR-76-465) Avail: NTIS HC A06/MF A01 CSCL 22B

Results are presented of acoustic tests performed on an STS payload shroud simulator to determine the effects of a helium filled liner on the noise reduction characteristics. The basic test program included the following configurations: (1) bare shroud (baseline configuration); (2) shroud with empty liner; (3) shroud with liner filled with air; and (4) shroud with liner filled with helium. The results indicate negligible effects from the helium. Configurations for liner filled with air, and liner filled with helium were also tested. The data from these configurations indicate increased noise reduction from the use of helium. Author

N77-12114*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PRELIMINARY VIBRATION, ACOUSTIC, AND SHOCK DESIGN AND TEST CRITERIA FOR COMPONENTS ON THE SRB, ET, AND SSME
Nov. 1976 586 p Revised
(NASA-TM-X-64868) Avail: NTIS HC A25/MF A01 CSCL 22B

Specifications for vibration, acoustic and shock design for components and subassemblies on the External Tank (ET), Solid Rocket Booster (SRB), and Space Shuttle Main Engine (SSME). Included are vibration, acoustic, shock, transportation, handling, and acceptance test requirements and procedures. The space shuttle ET, SRB, and SSME have been divided into zones and subzones. Zones are designated primarily to assist in determining the applicable specifications. A subzone (General Specification) is available for use when the location of the component is known but component design and weight are not well defined. When the location, weight, and mounting configuration of the component are known, specifications for appropriate subzone weight ranges are available. Criteria for some specific components are also presented. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N77-12115*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRIANGULAR COVARIANCE FACTORIZATIONS FOR Ph.D. Thesis. - Calif. Univ.
Catherine L. Thornton 15 Oct. 1976 211 p refs
(Contract NAS7-100)
(NASA-CR-149147; JPL-TM-33-798) Avail: NTIS HC A10/MF A01 CSCL 22A

An improved computational form of the discrete Kalman filter is derived using an upper triangular factorization of the error covariance matrix. The covariance P is factored such that P = UDUT where U is unit upper triangular and D is diagonal. Recursions are developed for propagating the U-D covariance factors together with the corresponding state estimate. The resulting algorithm, referred to as the U-D filter, combines the superior numerical precision of square root filtering techniques with an efficiency comparable to that of Kalman's original formula. Moreover, this method is easily implemented and involves no more computer storage than the Kalman algorithm. These characteristics make the U-D method an attractive realtime filtering technique. A new covariance error analysis technique is obtained from an extension of the U-D filter equations. This evaluation method is flexible and efficient and may provide significantly improved numerical results. Cost comparisons show that for a large class of problems the U-D evaluation algorithm is noticeably less expensive than conventional error analysis methods. Author

N77-12116# Illinois Univ., Urbana. Coordinated Science Lab.
THE ROLE OF CODING IN MULTIPLE-ACCESS SATELLITE COMMUNICATION SYSTEMS
Michael B. Pursley Apr. 1976 77 p refs
(Contract DAAB07-72-C-0259)
(AD-A025612; R-724; UILU-ENG-76-2212) Avail: NTIS HC A05/MF A01 CSCL 17/2

It has been demonstrated that coding can play a major role in multiple-access satellite communication systems. In addition to providing error-control capability as in single-user communication systems, coding actually provides the multiple-access capability in many multi-user systems. The subject of this report is the use of coding techniques in a multiple-access satellite communication system in which the communication capacity is to be shared by several asynchronous radio-frequency signals that occupy the same bandwidth. However, most of the concepts and techniques discussed in the paper apply to a wide variety of multiple-access communication systems in addition to satellite systems. results applicable to multiple-access communication systems from the fields of information theory, algebraic coding theory, and communication theory are presented along with a discussion of important mathematical models of multiple-access satellite systems and practical considerations and constraints in the design of such systems. Analytical results on the performance of phase-coded spread-spectrum multiple-access systems are obtained and some new multiple-access communication schemes for a satellite link in a computer-communication network are discussed. Author (GRA)

N77-12117# Oklahoma State Univ. Research Foundation, Stillwater. Electronics Lab.
SINGLE CHANNEL MONOPULSE CONVERTER Scientific Report, Mar. 1975 - Feb. 1976
R. Michael Fike 1 Mar. 1976 26 p refs
(Contract F19628-75-C-0084; AF Proj. 7659)
(AD-A025485; AFGL-TR-76-0085; SR-1) Avail: NTIS HC A03/MF A01 CSCL 09/6

Design of an improved single-channel monopulse converter for use in S-band autotrack antenna systems is described, including theory of operation and design trade-off factors. Specifications and performance data for both a prototype and improved version are given. A comparison is given of characteristics of both, compared to the previous version used in TRATEL I and II autotrack systems. Field trials in which rockets were tracked in flight are described briefly. The new design offers a simpler design with improved performance at lower cost. GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N77-12118*# Scientific Translation Service, Santa Barbara, Calif.
DETERMINING THE MOTION OF SPACE VEHICLES
P. Ye. Elyasberg, ed., G. A. Mersov, ed., B. Ts. Bakhshiyan, ed., and B. V. Kugaenko, ed. Washington NASA Sep. 1976 292 p refs Transl. into ENGLISH of the book "Opredeleniye Dvizheniya Kosmicheskikh Apparatov" Moscow, Nauka Press, 1975 p 1-203
(Contract NASw-2791)
(NASA-TT-F-17100) Avail: NTIS HC A13/MF A01 CSCL 22B

A collection of articles is presented which discusses the problem of determining the motion of spacecraft, under different assumptions about the indeterminancy of the law governing the distribution of measured parameters and parameters of the model of motion. Predicting the motion of earth and lunar satellites is examined. The motion of celestial bodies with respect to the center of mass is studied. Problems involving the selection and calculation of trajectories of motion of spacecraft are examined. Methods are presented for correcting the trajectories. Author

N77-12119*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A COMPARISON OF SPACECRAFT PENETRATION HAZARDS DUE TO METEOROIDS AND MANMADE EARTH-ORBITING OBJECTS
David R. Brooks Nov. 1976 27 p refs
(NASA-TM-X-73978) Avail: NTIS HC A03/MF A01 CSCL 22B

The ability of a typical double-walled spacecraft structure to protect against penetration by high-velocity incident objects is reviewed. The hazards presented by meteoroids are compared to the current and potential hazards due to manmade orbiting objects. It is shown that the nature of the meteoroid number-mass relationship makes adequate protection for large space facilities a conceptually straightforward structural problem. The present level of manmade orbiting objects (an estimated 10,000 in early 1975) does not pose an unacceptable risk to manned space operations proposed for the near future, but it does produce penetration probabilities in the range of 1-10 percent for a 100-m diameter sphere in orbit for 1,000 days. The number-size distribution of manmade objects is such that adequate protection is difficult to achieve for large permanent space facilities, to the

extent that future restrictions on such facilities may result if the growth of orbiting objects continues at its historical rate. Author

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N77-12120*# General Electric Co., Philadelphia, Pa.
ONBOARD EXPERIMENT DATA SUPPORT FACILITY. TASK 2 REPORT: DEFINITION OF ONBOARD PROCESSING REQUIREMENTS
Jan. 1976 166 p
(Contract NAS9-14651)
(NASA-CR-151108) Avail: NTIS HC A08/MF A01 CSCL 09B

The onboard experiment data support facility (OEDSF) will provide data processing support to various experiment payloads on board the space shuttle. The OEDSF study will define the conceptual design and generate specifications for an OEDSF which will meet the following objectives: (1) provide a cost-effective approach to end-to-end processing requirements, (2) service multiple disciplines (3) satisfy user needs, (4) reduce the amount and improve the quality of data collected, stored and processed, and (5) embody growth capacity. S.M.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N77-12121*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL-ENVIRONMENT TESTING OF A 30-cm ENGINEERING MODEL THRUSTER
Michael J. Mirtich 1976 23 p refs Presented at the 12th Intern. Elec. Propulsion Conf., Key Biscayne, Fla., 15-17 Nov. 1976; sponsored by AIAA
(NASA-TM-X-73522; E-8936) Avail: NTIS HC A02/MF A01 CSCL 21C

An experimental test program was carried out to document all 30-cm electron bombardment Hg ion bombardment thruster functions and characteristics over the thermal environment of several proposed missions. An engineering model thruster was placed in a thermal test facility equipped with -196 C walls and solar simulation. The thruster was cold soaked and exposed to simulated eclipses lasting in duration from 17 to 72 minutes. The thruster was operated at quarter, to full beam power in various thermal configurations which simulated multiple thruster operation, and was also exposed to 1 and 2 suns solar simulation. Thruster control characteristics and constraints; performance, including thrust magnitude and direction; and structural integrity were evaluated over the range of thermal environments tested. Author

N77-12122*# Scientific Translation Service, Santa Barbara, Calif.
ANALYSIS OF LIQUID-PROPELLANT ROCKET ENGINES DESIGNED BY F. A. TSANDER
L. S. Dushkin and Ye. K. Moshkin Washington NASA Dec. 1976 14 p Transl. into ENGLISH of conf. paper from Acad. Sci. USSR, Moscow Presented at the 10th Hist. Symp. of the Intern. Acad. of Astronautics, Anaheim, Calif., 15 Oct. 1976 p 1-11
(Contract NAS7-100)
(NASA-TT-F-16748) Avail: NTIS HC A02/MF A01 CSCL 21H

The practical works of F. A. Tsander are reviewed. The use of liquid oxygen, liquid hydrogen, and gasoline in reaction engines is discussed along with the OR-1, and OR-2 engines. F.O.S.

N77-12123*# Rasor Associates, Inc., Sunnyvale, Calif.
PULSED THERMIONIC CONVERTER STUDY Final Report
Apr. 1976 38 p refs
(Contracts NAS7-100; JPL-954219)
(NASA-CR-149234) Avail: NTIS HC A03/MF A01 CSCL 21C

A nuclear electric propulsion concept using a thermionic reactor inductively coupled to a magnetoplasmadynamic accelerator (MPD arc jet) is described, and the results of preliminary analyses are presented. In this system, the MPD thruster operates intermittently at higher voltages and power levels than the thermionic generating unit. A typical thrust pulse from the MPD arc jet is characterized by power levels of 1 to 4 MWe, a duration of 1 msec, and a duty cycle of approximately 20%. The thermionic generating unit operates continuously but with a lower power level of approximately 0.4 MWe. Energy storage between thrust pulses is provided by building up a large current in an inductor using the output of the thermionic converter array. Periodically, the charging current is interrupted, and the energy stored in the magnetic field of the inductor is utilized for a short duration thrust pulse. The results of the preliminary analysis show that a coupling effectiveness of approximately 85 to 90% is feasible for a nominal 400 KWe system with an inductive unit suitable for a flight vehicle. Author

N77-12124# Naval Weapons Center, China Lake, Calif.
EVALUATION OF INSULATION MATERIALS FOR ADVANCED MOTOR SYSTEMS Final Report, Jul. 1972 - Jun. 1974
A. T. Robinson May 1976 46 p refs
(AD-A025306; NWC-TP-5693) Avail: NTIS HC A03/MF A01 CSCL 21/8

This report summarizes a two-year effort on the testing and evaluation of nozzle inserts and insulation for advanced propellant-motor systems. Two series of tests were performed with a 12-inch diameter motors to evaluate blast tube liner insulation, nozzle inserts, and nozzle extension insulation. Each series was tested in a characteristic environment defined by the propellant composition. The first series of six tests was made utilizing C-518 propellant containing 17.5% aluminum the second series of five tests was made with RS-2, a nonaluminized propellant. The propellant loading for both series was intended to provide 1500 psi for 10 seconds. The C-518 propellant tests burned 1 second longer at a slightly reduced pressure the RS-2 burned for approximately 9 seconds at a higher pressure. By comparing the erosion susceptibility on a unit time basis, the values are normalized sufficiently to provide comparative results.
Author (GRA)

N77-12125# United Technologies Corp., Windsor Locks, Conn.
ROCKET ENGINE ASSEMBLIES AND GAS GENERATOR PLENUM Final Report
L. Ziegler 29 Jan. 1976 9 p refs
(Contract N00014-75-C-1078)
(AD-A025932; SP-01R76) Avail: NTIS HC A02/MF A01 CSCL 21/8

This contract covers the delivery of monopropellant rocket engines and a gas generator/plenum system for the Multiple Satellite Dispenser for the Naval Research Laboratory. This report summarizes all work accomplished under the contract and serves as an index to the program. Detail description and content of the summarized reports shall be found in the referenced documents. GRA

N77-12126# United Technologies Corp., Windsor Locks, Conn. Hamilton Standard Div.
DEVELOPMENT OF HYDRAZINE GAS GENERATOR/PLENUM SYSTEM Technical Report, Apr. - Dec. 1975
E. S. Abbott Jan. 1976 76 p refs
(Contract N00014-75-C-1078)
(AD-A025931; SVHSER-6786) Avail: NTIS HC A05/MF A01 CSCL 21/8

This report presents a programmatic review of the design, fabrication, and demonstration testing of a hydrazine Gas Generator/Plenum System, used to supply gas to very low thrust engines. Author (GRA)

N77-12127# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
EFFECT OF THE CONSTRICTIVE AREA RATIO ON THE ROCKET EXHAUST FLOW-FIELD IN THE LAUNCHER
John J. Bertin, Gena A. Garms, and Ed S. Idar, III Feb. 1976 62 p refs
(Contract DAAH01-73-C-1016)
(AD-A024657; Rept-76001) Avail: NTIS HC A04/MF A01 CSCL 19/7

There are a variety of military rockets which are launched from variable-area launch tubes. The change in cross section allows the rocket to be initially constrained after ignition, while momentum is gained. The flow of the high temperature and high pressure rocket exhaust gas is of practical interest in the structural design of the launcher. Of special concern is the possible generation of unbalanced forces on the rocket by exhaust gases which are deflected upstream (i.e., blow-by flow) and which could influence the trajectory, once the rocket is released from its constraints. Flow in the so-called 'non-tipoff' launch tubes is particularly complex since these tubes have diameter changes so that the rocket flies free of any tube support for a short distance as it emerges from the tube. The objectives of the experimental program included the determination of the parameters which govern the generation of a strong shock wave which may occur when the exhaust flow impinges on the wall. Of special interest was the determination of the ratio of the radius of the aft tube to the radius of the forward tube for which the flow was no longer choked by the constriction. GRA

N77-12128# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
EXPERIMENTS AND ANALYSIS RELATED TO EXTERNAL BURNING FOR PROPULSION Interim Report, Feb. 1975 - Jan. 1976
James E. Hubbartt, Warren C. Strahle, Douglas H. Neale, and Walter W. Wilson Mar. 1976 62 p refs
(Contract AF-AFOSR-2794-75; AF Proj. 9711)
(AD-A024984; AFOSR-76-0563TR) Avail: NTIS HC A04/MF A01 CSCL 14/2

The results of first year's efforts on an experimental base flow program are reported. The design and checkout for a Mach 3.0 axisymmetric wind tunnel with a model base diameter of 2.25 inches is described, as well as the automated data acquisition system. Experiments are reported on detailed static pressures for the diffuser wall, model wall and base and near wake. Temperature measurements are presented to establish a near adiabatic wall condition. The relationship between the experimental program and propulsive external burning is discussed. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N77-12129 Lowell Univ., Mass.
THE DIASTEREOSEQUENCE DISTRIBUTION RESULTING FROM A TWO-STATE MECHANISM INVOLVING FIRST ORDER MARKOVIAN ADDITION STEPS Ph.D. Thesis
Alfred P. Olson 1976 108 p
Avail: Univ. Microfilms Order No. 76-23572

A mechanism is proposed in order to explain the stereochemical structures which result from the homogeneous anionic polymerizations of unsymmetrical alpha olefins. The mechanism is a generalization of the two-state mechanism previously proposed by Coleman and Fox. The generalized mechanism postulates that a growing polymer chain may exist in either of two reactive states which are in dynamic equilibrium. Each state is capable of adding monemer, but each with its own stereospecificity. In addition, the tacticity of a placement being formed by the addition of monomer to the end of the growing chain, in either state, is affected by the tacticity of the immediately preceding placement in the chain. The resulting non-Markovian distribution is calculated. A method is given for experimentally testing the applicability of the mechanism. Dissert. Abstr.

N77-12130# Wisconsin Univ., Madison. Dept. of Chemistry.
IONIZATION PROCESSES RELEVANT TO THE FORMATION OF NEW MATERIALS Final Report, 1 Oct. 1970 - 31 Aug. 1975
Harlan L. Goering 31 Aug. 1975 4 p
(Grant AF-AFOSR-1972-71; AF Proj. 9538)
(AD-A025197; AFOSR-76-0539TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

This research program involved investigation of the structure and chemistry of intermediates in ionic reactions (viz. carbonium ion reactions). The approach has been to determine symmetry properties of product forming intermediates and from these deduce structural details of these intermediates. Kinetic, isotope tracer and stereochemical methods were used. In connection with the latter a new technique was developed which involves the use of optically active nmr shift reagents for the direct determination of enantiomeric compositions. With this technique it was possible to solve problems that could not be handled by other methods. Author (GRA)

24 COMPOSITE MATERIALS

Includes laminates.

N77-12131 Lehigh Univ., Bethlehem, Pa.
FRACTURE OF COMPOSITE ORTHOTROPIC PLATES CONTAINING PERIODIC BUFFER STRIPS Ph.D. Thesis
Feridun Delale 1976 126 p
Avail: Univ. Microfilms Order No. 76-21807

The fracture problem of laminated plates which consist of bonded orthotropic layers is studied. It is assumed that the medium contains periodic cracks normal to the bimaterial interfaces and the external loads are applied away from the crack region. The field equations for an elastic orthotropic body are transformed to give the displacement and stress expressions for each layer or strip. The unknown functions in these expressions are found by satisfying the remaining boundary and continuity conditions. A system of singular integral equations is obtained from the mixed boundary conditions. Three cases are considered: (1) the case of internal cracks; (2) the case of broken laminates; and (3) the case of a crack crossing the interface. The singular behavior around the crack tip and at the bimaterial interface is studied. Dissert. Abstr.

N77-12132 Lehigh Univ., Bethlehem, Pa.
THE EFFECT OF ADHESIVE LAYER ON CRACK PROPAGATION IN LAMINATES Ph.D. Thesis
Mehmet Rusen Gecit 1976 139 p
Avail: Univ. Microfilms Order No. 76-21811

The composite medium consists of parallel load carrying laminates and buffer strips arranged periodically and bonded with thin adhesive layers. The system is assumed to approximate boron-epoxy composites. Two problems are solved for both plane strain and plane stress cases. Thin adhesive layers are approximated by uncoupled tension and shear springs distributed along the interfaces of the strips for which only the case of internal cracks can be treated rigorously. The case of broken laminates is introduced to detect the true singular behavior in the presence of the adhesive layer. The adhesive is treated as an isotropic, linearly elastic continuum. General expressions for field quantities are obtained in terms of infinite Fourier integrals. Stress intensity factors and some significant stress components are calculated. The results are compared to those obtained by neglecting the adhesive layer (perfect bonding assumption). Dissert. Abstr.

N77-12133*# Materials Sciences Corp., Blue Bell, Pa.
FATIGUE OF NOTCHED FIBER COMPOSITE LAMINATES. PART 2: ANALYTICAL AND EXPERIMENTAL EVALUATION
S. V. Kulkarni, P. V. McLaughlin, Jr., and R. B. Pipes [1976] 120 p refs
(Contract NAS1-13931)
(NASA-CR-145039; MSC/TFR/601/1025-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 11D

The analytical/experimental correlation study was performed to develop an understanding of the behavior of notched

Boron/epoxy laminates subjected to tension/tension fatigue loading. It is postulated that the fatigue induced property changes (stiffness as well as strength) of the laminate can be obtained from the lamina fatigue properties. To that end, the Boron/epoxy lamina static and fatigue data (lifetime, residual stiffness and strength) were obtained initially. The longitudinal and transverse tension data were determined from the (0) and (90) laminate tests while the in-plane shear data were obtained from the (+ or - 45) sub s laminates. The static tests obtained the notched strength and mode of failure while the fatigue tests determined lifetime, damage propagation and residual strength. The failure in static tension occurred in a transverse crack propagation mode. Author

N77-12134*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECT OF LOW VELOCITY IMPACT DAMAGE ON THE COMPRESSIVE STRENGTH OF GRAPHITE/EPOXY HAT-STIFFENED PANELS

Marvin D. Rhodes, Jerry G. Williams, and James H. Starnes, Jr. 10 Dec. 1976 31 p refs

(NASA-TM-X-73988) Avail: NTIS HC A03/MF A01 CSCL 11D

Low velocity impact damage on the compressive strength of graphite/epoxy hat stiffened panels is studied. Fourteen panels, representative of minimum-mass designs for two compression load levels were tested. Eight panels were damaged by impact and the effect on compressive strength was evaluated by comparing the results with data for undamaged panels. The impact tests consisted of firing 1.27 cm diameter aluminum projectiles normal to the plane of the panel at a velocity of approximately 55 m/sec to simulate impact from runway debris. The results of this investigation indicate that impact damage in the panels designed for 0.53 MN/m was contained locally and the damaged panels were capable of carrying the design load. The panels designed for 1.58 MN/m failed between 50 and 58 percent of the design load due to impact damage in the high axial stiffness region. The extent of damage in the high axial stiffness region of both panel designs increased with the magnitude of applied axial load. Damage in this region was the most significant factor in reducing panel strength. Limited damage that was not visually detectable reduced ultimate strength as much as extensive visible damage. Author

N77-12135# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.

DYNAMIC BEHAVIOR OF LAMINATED POLYMERIC MATRIX COMPOSITES Annual Report, 15 Mar. 1973 - 15 Mar. 1974

Richard W. Mortimer and Pei C. Chou Wright-Patterson AFB, Ohio AFML Mar. 1976 61 p refs

(Contract F33615-73-C-5102; AF Proj. 7342)

(AD-A025622; AFML-TR-74-136) Avail: NTIS HC A04/MF A01 CSCL 11/4

The primary goal of this two-year program is to quantify, numerically and experimentally, the dynamic response of idealized laminated graphite-epoxy fan blades subjected to impact loads. Two impact cases will be studied: one is the short-time local response, idealized by wave propagation in laminated plates. The other is the structural response idealized by laminated beam. For each case, both numerical calculation and experimental tests will be conducted. The calculation will be based on a lamination theory and method of characteristic code. The experiments will involve a pendulum plate impact system. This report includes results of the theoretical and experimental predictions of wave velocities and strain histories for the case of inplane impact of aluminum, graphite epoxy cross-ply, and graphite epoxy angle-ply plates. In addition, preliminary results for the shear-loading impact of the aluminum plate are presented. Author (GRA)

N77-12136# Princeton Univ., N.J. Dept. of Civil and Geological Engineering.

WAVE PROPAGATIONS IN ORTHOGONALLY REINFORCED FIBER COMPOSITES. A DISCRETE MODEL FOR REINFORCED COMPOSITES VIEWED AS POLAR MEDIA Technical Report, Aug. 1975 - Aug. 1976

H. Demiray and A. C. Eringen Jun. 1976 21 p refs

(Contract N00014-76-C-0240; NR Proj. 064-410)

(AD-A025596; RR-76-SM-9; TR-39) Avail: NTIS HC A02/MF A01 CSCL 11/4

A discrete model for a composite reinforced with two sets of orthogonally interlocking fibers is given, and the propagation of plane harmonic waves in such a medium is investigated. The composite considered consists of two sets of orthogonal equivalent elastic fibers and a matrix material whose elastic properties are different from those of the fibers. Assuming a considerably large flexural rigidity for the fibers and strong bonds at the joints, the difference equations governing the translational and rotational motions of the joints are obtained. The dispersion relations of waves propagating in the medium are studied and various special cases are discussed. GRA

N77-12137# United Technologies Research Center, East Hartford, Conn.

INVESTIGATE FIBER REINFORCED Si13N4 Final Report, 1 Mar. 1975 - 31 Mar. 1976

John J. Brennan 31 Mar. 1976 57 p refs

(Contract N62269-75-C-0137)

(AD-A025901; R-76-912801-4; NADC-76147-30) Avail: NTIS HC A04/MF A01 CSCL 11/4

The report evaluates the Si3N4 system with emphasis on attempting to protect the Ta wires from oxidation by using a siliciding treatment prior to hot pressing, a Weibull analysis of RT strength of Si3N4-Ta composites, the thermal fatigue testing of Si3N4 and Si3N4-Ta wedge shaped samples between a furnace at 1300C and a cold (40C) fluidized bed, and an attempt to identify the grain boundary phases present in two different Si3N4 + 15 wt % Y2O3 materials. In addition, elevated temperature MOR and creep studies were done on Si3N4 + 15% Y2O3 + Ta composite samples. GRA

N77-12138# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.

INTERLAMINAR STRENGTH OF LAMINATED POLYMERIC MATRIX COMPOSITES Final Report, Jun. - Dec. 1973

E. Byron Pipes May 1976 33 p refs

(Contract F33615-73-C-5146; AF Proj. 7342)

(AD-A024722; AFML-TR-76-82) Avail: NTIS HC A03/MF A01 CSCL 11/4

An experimental program was conducted to examine the parameters involved in interlaminar strength criteria. Results indicate that for the boron/epoxy material treated, the interlaminar normal strength was approximately 11 ksi, but poor material quality clouded these results as well as the remaining issues in the proposed effort. GRA

N77-12139# Solar, San Diego, Calif.

NS-4 COATING PROCESS DEVELOPMENT FOR COLUMBIUM ALLOY AIRFOILS Final Report, Apr. 1974 - Feb. 1976

Victor S. Moore and Alvin R. Stetson Mar. 1976 75 p refs

(Contract DAAG46-74-C-0089)

(AD-A025797; RDR-1811; AAMRC-CTR-76-8; DRSAV-76-17)

Avail: NTIS HC A04/MF A01 CSCL 11/3

The excellent potential of the Solar NS-4 coating for protecting columbium alloy turbine vanes up to 1371C was demonstrated. Procedures were developed to coat both internal and external surfaces of configurations representative of turbine vanes. With spray application of the modifier (the NS-4 process is a two-cycle coating with a W-Mo-V-Ti modifier applied first and vacuum sintered followed by pack siliciding) consistent 500-hour protection at 1371C was obtained on external radii as small as 0.25 mm. Coating of internal surfaces by dipping was not reliable but many specimens survived 500 hours of cyclic exposure. Tests of coated 15-degree wedges in an oxidation/erosion rig showed no failures after 500 severe thermal cycles between 260C and 1371C. A number of cast hollow single vane segments were successfully coated and oxidation exposed one hour at 1371C. Appearance was excellent. Several problem areas that need additional investigation were elucidated, viz, coating of internal surfaces and temperature gradient induced coating stresses.GRA

N77-12140# Princeton Univ., N.J. Dept. of Civil and Geological Engineering.

THERMOMECHANICS OF FIBER-REINFORCED COMPOSITES Final Report, Nov. 1972 - Jan. 1976

A. C. Eringen and C. G. Speziale 8 Apr. 1976 39 p refs
(Contract DAHC04-69-C-0062)
(AD-A024948; ARO-8090.17-E; Rept-76-SM-6) Avail: NTIS HC A03/MF A01 CSCL 11/4

The stress analysis of filamentary composites was investigated and a theory was developed for the mechanics of composites reinforced with orthogonal interlocking fibers. A more concise form of nonlocal elasticity was developed and applied to the study of elastic waves and the problem of stress at the tip of a crack. It was found that the stress concentration was finite at the crack tip and goes as the square root of the crack length. By utilizing this result, a fracture criterion was developed based on the maximum stress. In addition, a constitutive theory was developed for nonlocal polar elastic solids and memory dependent nonlocal elastic solids. The outstanding problem of infinite stress at the crack tip was resolved opening new avenues of research for fracture criteria. Author (GRA)

N77-12141# Massachusetts Inst. of Tech., Cambridge.
STUDY OF PROCESSING AND PROPERTIES OF GRAPHITE FIBER/HIGH TEMPERATURE RESIN COMPOSITES Final Report
B. L. Lee and F. J. McGarry Apr. 1976 166 p refs
(Contract DAAG46-73-C-0256; DA Proj. 1W0-62113-A-661)
(AD-A024733; AMMRC-CTR-76-10) Avail: NTIS HC A08/MF A01 CSCL 11/4

The effect of processing conditions on the structure and properties of composites was examined using polyphenylquinoxaline and other high temperature resins as matrices and graphite fibers as reinforcement. It was observed that inadequate resin flow and volatile removal caused extensive voids in the laminate. The size and number of voids were found to be reduced by increasing resin flow as long as adequate measures were taken for the removal of volatiles. Increasing resin flow could be achieved by increasing the volatile content of the prepeg or by using a higher postcure temperature. However, reduction of voids was accompanied by an increasing tendency towards microcrack formation. A certain level of compaction is apparently necessary for the development of sufficient residual stress to cause translaminar cracking. Since the residual stress derives from the inherent properties of the components (differential thermal behavior of fiber and resin), elimination of crack formation problems may be impossible without modification of component properties. GRA

N77-12142# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala.
AN ASSESSMENT OF THE FRACTURE RESISTANCE OF THREE CHOPPED-FIBER REINFORCED PHENOLIC MATERIALS
Bobby R. Mullinix and Dallas G. Smith 22 Mar. 1976 27 p refs
(DA Proj. 1S3-22152-D-690)
(AD-A024672; RL-76-14) Avail: NTIS HC A03/MF A01 CSCL 20/11

Fracture toughness tests were conducted on three chopped-fiber reinforced phenolic materials. The three materials, supplied by Swedlow, Inc., are designated as FM 4030-190, FM 5821, and MX 2222-67. The standard ASTM method of three-point bending for the testing of metals was used as a guide for the testing program. FM 4030-190 and FM 5821 were also tested at approximate temperatures of -40 F and 140 F. The nonlinearity of the load-crack-opening displacement curves indicated a material toughness too great for the critical stress intensity factor to be determined by the ASTM method. In comparing the failure loads and the crack-opening displacement, the material MX 2222-67 was observed to have the least toughness, failing catastropically when the maximum load was reached. Materials FM 4030-190 and FM 5821 were much tougher, failing in a slow tearing mode. In comparison with MX 2222-67, the failure loads and the crack-opening displacement at failure, respectively, were about 3.6 and 6.4 times as great for FM 4030-190 and about 3.7 and 4.9 times as great for FM 5821. The failure loads of FM 4030-190 and FM 5821 increased for the cold tests and decreased for the hot tests. The decrease at the higher temperature was not severe. The toughness of FM 5821 varied less with the changes in temperature. Results were also obtained for the strength of the MX 2222-67 material based on bending tests of small beams cut from four liners, aged from 11 to 55 months. GRA

N77-12143# Oxford Univ. (England).
THE THERMAL CONDUCTIVITY OF METAL-POWER/EPOXY-RESIN COMPOSITES Annual Technical Report
F. F. T. DeAraujo and H. M. Rosenberg Jan. 1976 28 p refs
(Grant DA-ERO-75-G-018; DA Proj. 1T1-6110213-B-32D)
(AD-A024963; ATR-1) Avail: NTIS HC A03/MF A01 CSCL 11/4

The thermal conductivity of composites made from epoxy-resin Fpikote 828 with metal-powder fillers has been measured from 1.7 to 300 K. The metals were Cu, Ag, Au, Al, Sn, Pb, stainless steel and bronze, and in almost all cases the particles were spherical or rounded. At 20 K and above the thermal conductivity is independent of the particle size and is in good agreement with the relation of Meredith and Tobias extension of Rayleigh's theory. Below 20 K the thermal conductivity of the composite is lower than predicted by the theory especially for specimens containing smaller particles, and it can even be less than that of the unfilled resin. This is due to an acoustic mismatch of the phonons at the resin/particle interfaces. An 'effective particle conductivity' which takes account of this mismatch can be computed, which when incorporated into the theory leads to reasonable agreement with experiment. Author (GRA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N77-12144 Villanova Univ., Pa.
THE USE OF A PROTOTYPE CRYOGENIC GAS CHROMATOGRAPH IN COMBINATION WITH PTGC FOR ANALYSIS OF INORGANIC AND ORGANIC GASES: APPLICATION TO AIR POLLUTION STUDIES Ph.D. Thesis
Joseph A. Giannovario 1975 165 p
Avail: Univ. Microfilms Order No. 76-21995

A historical discussion of programmed temperature gas chromatography, sub-ambient cryogenic gas chromatography and air pollution analysis by gas chromatography is given, followed by a complete description of the construction and operation of a programmed cryogenic gas chormatograph. Design criteria specified a temperature control of + or - 0.1 C over the range -100 C to 300 C, a two column oven with dual detectors, operator selection and control of isothermal or programmed modes. The column compartment is warmed by two sets of heaters which can be paralleled for additional power and is cooled through the use of liquid nitrogen. Synthetic mixtures of gases were prepared to determine the proper column material and operating conditions. These mixtures contained both inorganic and organic gases. The flame ionization detector was modified to be able to detect the inorganic gases as well as the organic gases.
Dissert. Abstr.

N77-12145 New Mexico Univ., Albuquerque.
LASER PYROLYSIS GAS CHROMATOGRAPHY AND PLASMA STOICHIOMETRIC ANALYSIS Ph.D. Thesis
Ray Lorain Hanson 1975 257 p
Avail. Univ. Microfilms Order No. 76-22145

Normal pulse laser interaction with organic solids was studied. Extensive interaction between the carrier gas and the plasma occurred in the quenching process. When hydrogen was used as the carrier gas, significantly greater quantities of products were detected from the laser pyrolysis of graphite and coal compared to laser pyrolysis in helium. Acetylene was shown to be the principal hydrocarbon product from plasma quenching. Equilibrium product distributions calculated at high temperatures by the minimization of free energy revealed that hydrogen and acetylene were the primary gaseous plasma quenching products for hydrocarbons. Organic solids with oxygen present in the

molecule yielded carbon monoxide as an additional plasma quenching product. The model of quenching assumed that H and C2H quenched to H2 and C2H, respectively. Dissert. Abstr.

N77-12146 Indiana Univ., Bloomington.
ELECTROSTATIC CALCULATIONS IN MEMBRANE SYSTEMS Ph.D. Thesis
Bruce Edward Enos 1976 173 p
Avail: Univ. Microfilms Order No. 76-21559

The dissociation and average surface potential per site for a membrane modeled as a lattice of discrete titratable sites arranged in a square array are calculated. The hydrogen ion titration curve for such a membrane surface was obtained by considering the charges on the surface to be a two dimensional lattice gas of particles which interact through a potential of mean force determined by the fixed chemical potentials of the ionic species in the bathing solution. The titration curve was solved by developing a virial expansion of the equation of state characterizing the two dimensional lattice gas, and the results compared to other titration curves derived from: (1) a Bragg-Williams random distribution of the charges over the lattice sites, (2) the quasi-chemical approximation, and (3) models assuming that the net charge on the surface is smeared to form a uniform charge density on the membrane surface. Dissert. Abstr.

N77-12147 Villanova Univ., Pa.
INVESTIGATIONS OF COLUMN PACKING MATERIALS FOR GAS SOLID CHROMATOGRAPHY Ph.D. Thesis
Mary Agnes Kaiser 1976 96 p
Avail: Univ. Microfilms Order No. 76-22001

Three important aspects of gas-solid chromatography, namely specific surface area analysis, the evaluation of some inorganic oxides as column packing materials, and the utility of certain polymers as column packing materials in environmental studies were studied. The specific surface areas of over one hundred compounds were measured using a gas adsorption method and compared with several methods to determine the precision and accuracy of the technique as well as the effect of certain experimental parameters. A comparison of surface area data among various methods (e.g., gas adsorption, X-ray analysis, heat of immersion, fluid permeability) show poor correlation. Some of these differences are attributed to variations in sampling, pore and particle size variation, and differences in the physicochemical principles applied to the technique. Dissert. Abstr.

N77-12148 Colorado Univ., Boulder.
MATRIX AFFINITY CHROMATOGRAPHY AND ITS APPLICATION TO THE CONCENTRATION AND SEPARATION OF TRACE ORGANICS IN WATER Ph.D. Thesis
Paul Albin Larson 1976 157 p
Avail: Univ. Microfilms Order No. 76-23644

Matrix affinity chromatography is based on the partitioning of the organic solute between the mobile phase and the resin phase. When a polystyrene divinylbenzene based resin is used, unionizable organic solutes can be retained through dispersion interactions with the resin matrix. The recovery efficiencies for pyrene from aqueous pyrene solutions of several resins, were found to be independent of the exchange site and type of resin for polystyrene resins. The recovery efficiencies of eight model compounds on the polystyrene ion exchange resin Bio-Rad MP-50, Ca(+2), averaged 90% recovery. Hexachlorocyclohexane was shown to be adsorbed by the MP-1, and Chelex -100, Ca(+2) resins. Recovery was much lower on the MP-50 resin. The hexachlorocyclohexane was not retained by the Bio-Rex 70 at all. Dissert. Abstr.

N77-12149 Clemson Univ., S.C.
AN ECONOMICAL SQUARE-WAVE POLAROGRAPH FOR ELECTROCHEMICAL ANALYSIS Ph.D. Thesis
William Jennings Lewis 1976 74 p
Avail: Univ. Microfilms Order No. 76-23047

A square wave polarograph was constructed which can be easily assembled at a modest cost. The electrical complexity of the timing circuit was reduced by a sine wave generator phase shifter combination which controls the timing pulse to a field effect transistor gate. Solid state operational amplifiers are used throughout the instrument to simplify the electrical logic and reduce the cost of construction. The capability of the instrument includes direct current and square wave polarography, anodic stripping voltammetry and square wave anodic stripping voltammetry. It can function as a 125 ma potentiostat for electrolysis or constant potential studies or, with modification, be used in cyclic voltammetry and coulometry. Dissert. Abstr.

N77-12150 Arizona Univ., Tucson.
INVESTIGATIONS INTO NEW METHODS OF ANALYSIS BY ATOMIC AND MOLECULAR FLUORESCENCE AND FLAME EMISSION Ph.D. Thesis
Ronald Frederick Suddendorf 1976 187 p
Avail: Univ. Microfilms Order No. 76-22477

Investigations are described into the design, construction and evaluation of a premixed oxygen-hydrogen burner for the analysis of small sample volumes by flame emission and atomic fluorescence. Data are presented showing gas flow rates and maximum allowable burner temperature to produce a safe and stable premixed flame of either oxygen-hydrogen or oxygen-acetylene. A special one hole insert burner was constructed which allowed the safe acquisition of this data as both a function of exit port diameter and burner temperature. The sample introduction method, which is based on pulsed ultrasonic nebulization, includes the capability to change samples without extinguishing the flame. Included in the study is the effect of pulse time and sample volume on the mission intensity. Such data are valuable in determining the optimum operating conditions for a given analysis. Dissert. Abstr.

N77-12151 Villanova Univ., Pa.
ANALYTICAL APPLICATIONS OF A HIGH RESOLUTION ECHELLE MONOCHROMATOR Ph.D. Thesis
Charles Colburn Wohlers 1975 134 p
Avail: Univ. Microfilms Order No. 76-21999

Possible uses of a commercial high resolution and dispersion echelle monochromator in analytical chemistry are described. First, equations are developed demonstrating the theoretical lowering of detection limits in emission spectrometry caused by a high resolution monochromator through the increased line-to-background ratios. The historical development and use of echelle gratings are traced, and their characteristics are described and compared with conventional gratings; since echelle gratings use high blaze angles, they give much higher resolution and dispersion without sacrificing optical speed. The grating equations pertaining to echelles are developed in some detail. These are then used to compare echelle monochromators to Fabry-Perot interferometers and to describe hypothetical monochromator designs for various uses in analytical chemistry where echelle monochromators can provide significant advantages. Dissert. Abstr.

N77-12152 New Mexico Univ., Albuquerque.
OXYGEN POTENTIAL OF URANIUM-PLUTONIUM OXIDE AS DETERMINED BY CONTROLLED-ATMOSPHERE THERMOGRAVIMETRY Ph.D. Thesis
Gerald Craig Swanson 1975 141 p
Avail: Univ. Microfilms Order No. 76-22166

The oxygen to metal atom ratio, or O/M, of solid solution uranium-plutonium oxide reactor fuel is a measure of the concentration of crystal defects in the oxide which affect many fuel properties, particularly, fuel oxygen potential. Measurement of the oxygen potential of solid solution uranium-plutonium oxide, O/M reference material at O/M ratios near 2.000 provides baseline O/M values for thermogravimetric and gas equilibration methods of O/M analysis. The oxygen potential of the atmosphere within a modified commercial thermobalance has been controlled by the ratio of H2O and H2 added to a He carrier gas. The balance modifications include enclosure of the sample chamber within glovebox for handling plutonium, redirection of gas flow to ensure sample equilibration, and digital recording of data on paper tape for off-line computer analysis. Dissert. Abstr.

N77-12153 South Carolina Univ., Columbia.
DETERMINATION OF THE TORSIONAL BARRIERS AROUND SINGLE BONDS BY VIBRATIONAL SPECTROSCOPY Ph.D. Thesis
William Earle Bucy 1976 189 p
Avail: Univ. Microfilms Order No. 76-21878

A series of peaks in the Raman spectra of gaseous CH3CH3, CH3CH2CL, CH3CD2BR, CH3CD2BR, CD3CH2Br, CD3CD2Br,

CH3CH2I, CH3CD2I, and CD3CH2I were observed and assigned to the torsional overtones of the methyl group. From these spectroscopic data, barriers to internal rotation have been calculated for the ethyl halides For the compounds where the barriers are accurately known from previous work, the values obtained in this study agree quite well. The value for the internal rotational barrier in ethyl iodide is 3.67 + or - 0.01 kcal/mole which is considerably higher than the value previously reported from microwave studies. It is shown that Raman spectroscopy can be a convient technique for obtaining torsional barrier heights when one uses the torsional overtones quantum jumps of the torsional motion. Dissert. Abstr.

N77-12154 Northern Illinois Univ., Dekalb.
DIFFERENTIAL COULOSTATIC POLAROGRAPHY Ph.D. Thesis
Joseph Michael Katzenberger 1976 113 p
Avail: Univ. Microfilms Order No. 76-21850

The problems associated with the application of coulostatic techniques to electrochemical analysis are discussed. It is found that there are many variables which must be controlled or accounted for in order to apply the coulostatic method to electroanalysis. The shape of the polarograms obtained are found to be dependent on the double layer capacitance, the magnitude of the perturbation, the flow rate of the electrode, and of time of the measurement. A simplified theoretical analysis of the method is discussed to determine what effects these parameters should have on the observed polarograms. It is found that most of these parameters can be easily controlled. The development of the instrumentation which is necessary to control the experiment is discussed. Preliminary experimental results of anodic stripping differential coulostatic polarography are presented. These results indicate that the deposition times for anodic stripping could be reduced when the method is combined with differential coulostatic polarography. Dissert. Abstr.

N77-12155 Polytechnic Inst. of New York.
INTERACTION OF AQUEOUS ELECTROLYTES AND QUATERNARY AMMONIUM SALTS Ph.D. Thesis
Lee-york Lydia Hwang 1976 207 p
Avail: Univ. Microfilms Order No. 76-23412

The wavelength shifts in the visible spectrum at 25 C of the quaternary ammonium indicator caused by aqueous electrolytes are described. Quaternary ammonium salts and sodium p-toluene sulfonate showed very large molar shifts (up to 60nm), always to longer wavelengths. The effects were ascribed to cation-cation attractive interaction, and in the case of p-toluene sulfonate to water-structure-enforced ion pair formation. The very strong and apparently special interaction between quaternary ammonium salts (including anion-exchange resins) and acids in water - the so-called acid effect - is described. The increase in solubility of various quaternary ammonium perchlorates in increasing concentrations of HBr increased with increasing chain length. Dissert. Abstr.

N77-12156 Virginia Polytechnic Inst. and State Univ., Blacksburg.
PREPARATIVE HIGH PERFORMANCE LIQUID CHROMATOGRAPHY Ph.D. Thesis
Rodolfo Guilherme Berg 1976 129 p
Avail: Univ. Microfilms Order No. 76-23209

A balanced density slurry-packing apparatus was developed and used to pack sixteen HPLC columns having different lengths and internal diameters. The evaluation of these columns led to several conclusions: the column efficiency, expressed in plates per meter, is a function of the ratio of column internal diameter to column length and increases as this ratio increases; a new definition for preparative efficiency, time yield factor (TYF), is proposed. This factor differentiates among HPLC columns with different lengths and internal diameters using samples of the same volume and concentration; the column that showed the highest TYF value was used for the preparative separation and identification of three positional isomers of high molecular weight. Dissert. Abstr.

N77-12157*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AUTOMATIC MULTIPLE-SAMPLE APPLICATOR AND ELECTROPHORESIS APPARATUS Patent Application
Benjamin W. Grunbaum, inventor (to NASA) (Calif. Univ., Berkeley) Filed 24 Nov. 1976 18 p Sponsored by NASA
(NASA-Case-ARC-10991-1; US-Patent-Appl-SN-744574) Avail: NTIS HC A02/MF A01 CSCL 07D

A multiple sample applicator is described which coacts with a novel tank cover to permit an operator either to depress a single button, thus causing multiple samples to be deposited on the gel or on the membrane simultaneously, or to depress one or more sample applicators separately by means of a separate button for each applicator. Greater resolution is achieved by performing two dimensional migrations in a square gel tray. First, the sample is pulled apart in a linear path by the electric current, and then the square gel tray is lifted and turned 90 deg so that the first migration is pulled apart from an orthogonal direction. The square gel tray is held in place at two opposite corners by retainers on the temperature controlled plate. These retainers insure an exact 90 deg change when the tray is repositioned. NASA

N77-12158*# Colorado State Univ., Fort Collins.
A THEORETICAL EVALUATION OF RIGID BAFFLES IN SUPPRESSION OF COMBUSTION INSTABILITY
M. R. Baer (Sandia Labs., Albuquerque, N. Mex.) and C. E. Mitchell 13 Sep. 1976 43 p refs Prepared in cooperation with Sandia Labs., Albuquerque, N. Mex. Backup document for AIAA Synoptic scheduled for publication in the AIAA Journal, Feb. 1977
(Grant NGR-06-002-095)
(NASA-CR-149167) Avail: NTIS HC A03/MF A01 CSCL 21B

An analytical technique for the prediction of the effects of rigid baffles on the stability of liquid propellant combustors is presented. A three dimensional combustor model characterized by a concentrated combustion source at the chamber injector and a constant Mach number nozzle is used. The linearized partial differential equations describing the unsteady flow field are solved by an eigenfunction matching method. Boundary layer corrections to this unsteady flow are used to evaluate viscous and turbulence effects within the flow. An integral stability relationship is then employed to predict the decay rate of the oscillations. Results show that sufficient dissipation exists to indicate that the proper mechanism of baffle damping is a fluid dynamic loss. The response of the dissipation model to varying baffle blade length, mean flow Mach number and oscillation amplitude is examined.Author

N77-12159# European Space Agency, Paris (France).
HIGH RESOLUTION 7 - 16 MICRON INFRARED SPECTROMETRY
Jean Botineau Oct. 1976 68 p refs Transl. into ENGLISH of 'Spectrometrie Infrarouge a Haute Resolution de 7 a 16 micron', ONERA, Paris Report ONERA-NT-176, 1971 Original report in FRENCH previously announced as N71-31930
(ESA-TT-328; ONERA-NT-176) Avail: NTIS HC A04/MF A01

Alterations were made to a grid spectrometer in order to extend its use to gas molecular spectroscopy. This spectrometer was equipped with a precise calibration device: a source of known spectral composition supplies the reference points to the spectrum under study; an accurate interpolation between these points is made possible by using an interferometric device. A rational adaptation of cooled quantum detectors was also studied; a liquid helium cryostat of a new type was designed with a view to using, in the best conditions, a copper-doped germanium sensor. A complete atlas of the methane nu sub 4 band, around 1300/cm, was established; the fine structure of the three P, Q, and R branches is evidenced in the spectra obtained. Lastly, a study aiming at making more objective and more accurate the numerical data reduction has been undertaken. Author (ESA)

N77-12160# European Space Agency, Paris (France).
APPLICATION OF COHERENT ANTI-STOKES RAMAN SCATTERING TO MEASUREMENTS OF GAS CONCENTRATIONS IN AERODYNAMIC FLOWS
Francois Moya Oct. 1976 78 p refs Transl. into ENGLISH of 'Appl. de la Diffusion Raman Anti-Stokes Coherente aux Mesures de Concentrations Gazeuses dans les Ecoulements', ONERA, Paris Report ONERA-NT-1975-13, 1975 Original report in FRENCH previously announced as N77-10170
(ESA-TT-331; ONERA-NT-1975-13) Avail: NTIS

HC A05/MF A01

An account is given of the spontaneous Raman effect and of the performances reached in gas concentration (and temperature) measurements using instruments operating on the principle of this scattering. A semi-classical study of coherent anti-Stokes Raman scattering enables the main characteristics and limitations of this scattering to be taken into account in its application to gas concentration measurements. The results obtained by this method, both with a ruby laser associated with a stimulated Raman effect oscillator and a ruby laser associated with a dye laser, are presented. The vibrational transition line profiles Q(J) of hydrogen, oxygen, and nitrogen were obtained at 300 K together with concentration and temperature measurements of hydrogen evolved within a gas flame. Author (ESA)

N77-12161# European Space Agency, Paris (France).
EMISSION SPECTROSCOPICAL INVESTIGATION OF THE SYSTEM F2-H2 IN A SHOCK TUBE
Gerhard Rimpel Nov. 1976 97 p refs Transl. into ENGLISH of "Emissionsspektroskopische Untersuch. des Systems F2-H2 im Stossrohr", DFVLR, Stuttgart Report DLR-FB-76-27, 30 Apr. 1976 Original report in GERMAN previously announced as N76-33305 Original German report available from DFVLR, Cologne DM 30
(ESA-TT-349; DLR-FB-76-27) Avail: NTIS HC A05/MF A01

In a shock tube, Ar-F2-H2-mixtures containing 0.2% F2 and 0.2% H2, were heated up to temperatures of approximately 830 and 940 K, respectively. The pressures amounted to 3.6 bar. The reaction was observed via the radiation emission of the vibrational excited HF molecules. The spectral range from 660 to 960 nm was investigated. From these measurements it was possible to determine the population numbers of discrete vibrational levels (v = 3, ...9) of the HF molecule. Chemical kinetic calculations were carried out in order to evaluate information on rate coefficients of certain elementary reactions. By adapting the calculations to the measurements it was found that VVT processes between HF and HF occur much faster at higher vibrational quantum numbers than originally supposed. Furthermore, statements could be made on VT processes between HF and Ar as well as on the pumping reaction H + F2 yields HF + F. Author (ESA)

N77-12162# Paris VI Univ. (France). Lab. d'Optique des Solides.
INVESTIGATIONS OF SURFACES AND INTERFACES USING OPTICAL EXCITATION OF SURFACE PLASMONS Annual Report, Aug. 1974 - Jul. 1975
F. Abeles and T. Lopez-Rios Mar. 1976 49 p refs
(Grant DA-ERO-75-G-02; DA Proj. 1T1-61102-B-11B)
(AD-A025285) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report covers the possibility of using the optical excitation of surface plasmons by Attenuated Total Reflection (ATR) for the investigation of the metal-electrolyte interface. The method is very sensitive to the modifications of the interface, an it allows studies which are otherwise extremely difficult to perform using classical optical techniques. By the (ATR) technique, the author investigated the modifications of the complex wave vector of the surface plasmons, and these have a clear physical meaning. This technique was used in performing potentiometric and optical studies of AU-electrolyte interfaces both polarization at the interface between gold and H2 SO4 and HCL)4 solutions, and also the anodic oxidation of gold in H2 SO4 were investigated. GRA

N77-12163# Stanford Research Inst., Menlo Park, Calif. Molecular Physics Center.
PHOTON INTERACTIONS WITH ATMOSPHERIC NEGATIVE IONS Final Report, 1 Apr. 1973 - 31 Mar. 1976
P. C. Cosby, J. T. Moseley, and J. R. Peterson 28 May 1976 103 p refs
(Contract DAHC04-73-C-0016; SRI Proj. PYU-2536)
(AD-A025770; SRI-MP-76-48; ARO-11459.7-P) Avail: NTIS HC A06/MF A01 CSCL 07/5

This research was undertaken to fill a serious gap in the knowledge of the ionospheric D region behavior concerning the photoproduction of the electrons from negative ions. The information is needed for the codes that predict electron densities and ion concentrations for radar and radio communications in an atmospheric nuclear burst environment. Photodetachment cross sections had been measured for only a few simple atmospheric species. No information was available on the more complex species CO(-)3, NO(-)3, and their hydrates, which dominate the D region negative ions. Photodissociation had not been studied at all. A drift tube-mass spectrometer apparatus was constructed especially for this research, coupled with an argon ion laser and a tunable dye laser. The study has yielded interesting and important results. GRA

N77-12164# Stanford Research Inst., Menlo Park, Calif.
THERMOCHEMISTRY OF GASEOUS METAL OXIDES Final Report, 1 Apr. 1973 - 31 Dec. 1975
D. L. Hildenbrand Mar. 1976 55 p refs
(Contract F19628-73-C-0150)
(AD-A025661; AFGL-TR-76-0061) Avail: NTIS HC A04/MF A01 CSCL 07/4

The dissociation energies and ionization potentials of gaseous oxides in the Th-O, Zr-O, Ti-O, Eu-O, and U-O systems have been determined by high temperature mass spectrometry. Dissociation energies were derived from gaseous equilibrium measurements, while the ionization potentials were obtained from electron impact threshold measurements. Specifically, data were obtained for gaseous ThO, ThO2, ZrO, ZrO2, TiO, TiO2, EuO, UO2, and UO3. Attempts to characterize the higher oxide of aluminum, AlO2, were unsuccessful. New experimental information on the ionization potentials of Th, Zr, and Eu was also obtained. The results make it possible to accurately define the energetics of a number of ion-neutral and neutral-neutral reactions of the metals which are of importance in the analysis of nuclear burst effects. GRA

N77-12165# British Steel Corp., Sheffield (England). Information Services.
A COMPARISON OF PRACTICAL AND THEORETICAL CORRECTION FACTORS FOR USE IN X-RAY FLUORESCENCE ANALYSIS OF OXIDE MATERIALS
A. A. Tunney Jun. 1974 35 p refs
(PB-256054/8; GS/TECH/674/1/75/C) Avail: NTIS HC A03/MF A01 CSCL 11F

In the X-ray fluorescence analysis of oxide materials, interelement effects can be a major source of error. Mathematical corrections for these effects are becoming more developed and an investigation has been carried out to compare the validity of two sets of correction factors (alphafactors) derived (a) from intensity measurements on a suite of specially prepared synthetic samples and (b) by calculation from a mathematical model of the X-ray fluorescence process. GRA

N77-12166# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
THE ELECTRON FACTOR IN CATALYSIS ON METALS ELECTROCATALYSIS ON NON-METALLIC SURFACES Final Report
L. H. Bennett and A. D. Franklin May 1976 71 p refs Sponsored in part by NSF and ERDA
(PB-256264/3; NBSIR-75-1049) Avail: NTIS HC A04/MF A01 CSCL 07D

Two related workshops were held in topics of importance for energy conversion. These topics, concerned with some of the science underlying the development of fuel cells for electric utility use, are: (1) the electron factor in catalysis on metals; and (2) electrocatalysis on non-metallic surfaces. Discussions of the needs and expected benefits, lists of attendees, descriptions of the programs and summaries of the major problems, advances, and opportunities revealed by the workshops are included. Author

N77-12167# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STUDY OF FACTORS AFFECTING REACTIONS IN ENVIRONMENTAL CHAMBERS Final Report
Raphael J. Jaffe 30 Jun. 1975 234 p refs
(Contracts EPA-68-02-0287; EPA-68-02-1270)
(PB-256252/8; LMSC-D406484; CRC-APRAC-CAPA-1-69-3) Avail: NTIS HC A11/MF A01 CSCL 07C

An experimental study has been conducted of effects of materials, spectrum, surface/volume ratio and cleaning technique on the photochemical reactions observed in a smog chamber. A

unique chamber and lighting system was used, which permitted independent variation in chamber materials and in light conditions. A xenon arc lamp-parabolic reflector combination provided a collimated light beam. By orienting plates of materials parallel to the beam, it was possible to independently vary light conditions and materials. GRA

N77-12168# DARCOM Intern Training Center, Texarkana, Tex.
APPLICABILITY OF SPECTROMETRIC OIL ANALYSIS TO INTERNAL COMBUSTION ENGINES: INITIAL PHASE OF EXTENDED LIFE TEST Final Report
Robert G. Elmore Apr. 1976 123 p refs
(AD-A024743; DARCOM-ITC-02-08-76-102). Avail: NTIS HC A06/MF A01 CSCL 21/7

This report contains the description of an experimental method to determine the applicability of spectrometric oil analysis to single cylinder internal combustion engines. Spectrometric oil analysis is used to determine the concentrations of elemental particles in the oil. Physical measurements of engine components are used, along with results of spectrometric oil analysis, to determine wear rates for the engines. Four heavy duty Wisconsin engines, model number MBKNB, are used for this experiment. Preliminary results for three engines, operated for 40 hours each, are presented in this report. Regression analysis is applied to the data obtained. Experiment results show statistically similar trends, on each engine, for several of the elements analyzed. Continuation of the experiment is, therefore, recommended.
Author (GRA)

N77-12169# Washington Univ., Seattle. Chemometrics Lab.
IMPROVING THE RELIABILITY OF FACTOR ANALYSIS OF CHEMICAL DATA BY UTILIZING THE MEASURED ANALYTICAL UNCERTAINTY Technical Report, Nov. 1975 - Jun. 1976
D. L. Duewer, B. R. Kowalski, and J. L. Fasching Jun. 1976 57 p
(Contract N00014-75-C-0536; NR Proj. 051-565)
(AD-A025951; TR-9) Avail: NTIS HC A04/MF A01 CSCL 07/4

A procedure for including measured analytical uncertainty into data analysis methodology is discussed. The suitability of various dispersion matrices and matrix rank determination criteria for data having analytical uncertainty is investigated. A criterion useful for judging the number of factors insensitive to analytical uncertainty is presented. A model data structure for investigating the behavior of factor analysis techniques is described and analyzed. Author (GRA)

N77-12170# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
VISIBLE WAVELENGTH CHEMILUMINESCENCE INITIATED BY CO2 LASER RADIATION Final Report
Simon H. Bauer and Ezra Bar-Ziv 30 Apr. 1976 31 p
(Grant AF-AFOSR-2629-74; AF Proj. 9538)
(AD-A025002; AFOSR-76-0565TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

Visible chemiluminescence is emitted when gaseous mixtures of encapsulated metals (SiH4, Ge(C2H5)4, Sn(CH3)4, Pb(CH3)4, Bi(CH3)3), SF6, and various oxidizers (N2O, NO2, NF3) are subjected to a 20J pulse (fwhm approx. 1 microsecond) of CO2 10.6 micrometer laser radiation. The wavelength dependence of these emissions was recorded photographically with a 1m JA spectrograph. The various band systems for the excited diatoms were identified; for example, S*2, MF*, MO*. The temporal emission sequence was recorded with a four-channel, wide-band photometer, and a 14-channel narrow-band spectrophotometer (band pass approximately 70 A). The magnitude of luminosity was measured as a function of the total pressure and the composition of the mixtures. For several combinations relatively narrow spikes (fwhm approx. 10 microseconds) were observed. For CuF* (the copper was inserted in the form of a salt or a metal foil) very large vibrational temperatures in the upper electronic states were deduced. These features, and the appearance of some bands with high vibrational quantum numbers in the ground electronic state, suggest that inversions may have been produced by this technique. Author (GRA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N77-12171 Pennsylvania Univ., Philadelphia.
MAGNETIC RESONANCE STUDIES OF PARAMAGNETIC TRANSITION METAL COMPLEXES Ph.D. Thesis
Vijay Kumar Kapur 1976 213 p
Avail: Univ. Microfilms Order No. 76-22713

Nitrogen-14 n.m.r. was used to understand the mechanism of spin delocalization in the paramagnetic acetonitrile complexes of Cu(II), Ni(II), Co(II), and Ti(III). Contact shifts and line broadening data were obtained for these complexes as a function of temperature. Electron paramagnetic resonance and electronic spectral studies show the existence of basal and axial isomers of the stereochemically non-rigid adduct molecule. The basal isomer has the PPh3 molecule ligated approximately in the basal plane of the CU(Hfacac)2 chelate, while in the axial isomer PPh3 is ligated in a position perpendicular to the plane of the chelate. The appearance and the absence of the P-31 superhyperfine structure in the e.p.r. spectra is attributed to the basal and the isomer predominates in almost all the solvents, whereas at liquid N2 temperature it is stabilized in toluene solvent only.
Dissert. Abstr.

N77-12172 Washington State Univ., Pullman.
UNUSUAL FIVE-COORDINATE COMPLEXES OF TRANSITION METAL IONS Ph.D. Thesis
Mike Harold West 1976 68 p
Avail: Univ. Microfilms Order No. 76-21402

A new tridentate ligand, 1, 5-diazacyclooctane-N-monoacetic acid (dacoma), has been synthesized. By comparison with the closely related ligand 1, 5-diazacyclooctane-N, N'-diacetic acid (dacoda), dacoma is expected to restrict metal ions to square pyramidal five-coordinate geometry. Chelation of dacoma leads to a well defined geometry in which the ligand occupies three planar sites with the remaining planar site and one apical site left free for additional coordination. The Ni(II), Cu(II), and Zn(II) complexes of dacoma were prepared and characterized by magnetic susceptibility measurements, X-ray powder-pattern analysis, visible absorption and infrared spectroscopy as well as potentiometric pH titrations. The Ni(II) and Zn(II) complexes of dacoma are isomorphous in the solid state, but the Cu(II) complex is not. It is confirmed that a biphasal CD spectrum with a lower energy, positive band, which is dominant or comparable in intensity to a higher energy negative band, is characteristic of this mode of amino acid chelation to Cu(II). Dissert. Abstr.

N77-12173 National Lending Library for Science and Technology, Boston Spa (England).
DISTRIBUTION OF ELECTRON DENSITY IN A TRANSITIONAL METAL IMPURITY IN DILUTE SUBSTITUTION SOLID SOLUTIONS
S. E. Balakir, S. D. Zvonkov, and Yu. S. Stark 1975 11 p refs Transl. into ENGLISH from Izvest. Vyssh. Ucheb. Zaved. (USSR), v. 11, 1975 p 136-138
(NLL-M-25348-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

An expression for the density in an impurity transitional metal in a dilute solid solution of a non-transitional metal was obtained with a free electron approximation by the method of phase shifts, taking into account the effects of resonance dissipation. Ambiguity in the expression obtained was avoided by comparing the theoretical relationship with experimental data for the radial distribution of electrical field gradients in the Al-Sc system. The equation provides good coincidence with the results of experiments with a resonance level width of 4 eV. Author

N77-12174 National Lending Library for Science and Technology, Boston Spa (England).
FORMATION OF AN IMPEDED RECRYSTALLIZATION ZONE DURING THE ANNEALING OF LOW-ALLOY MOLYBDENUM ALLOYS
L. A. Bazhan, Yu. O. Mezhennyi, A. P. Senichkin, and Yu. A. Skakov 1975 15 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 11, 1975

p 139-144
(NLL-M-25349-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Optical and electron microscope methods and X-ray structural analysis have shown that the principal reason for the impedance of recrystallization in the surface layers of rolled TsM-2A alloy sheets lies not in the features of the dislocation structure of these layers but in particles (mainly ZrO2) forming as a result of action by the furnace atmosphere during annealing. Author

N77-12175 National Lending Library for Science and Technology, Boston Spa (England).
ENGINEERING EFFICIENCY OF HIGH UNIT-CAPACITY METALLURGICAL UNITS
E. M. Borisov and A. M. Gurevich 1976 10 p Transl. into ENGLISH from Stal (USSR), no. 1, 1976 p 65-67
(NLL-M-25379-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

A tendency towards greater unit plant capacity is detected over all forms of processing from sinter and pellet firing machines to section rolling mills. Heavy plants (blast furnaces and oxygen converters) are being built in all the industrially developed capitalistic countries. The increases in blast furnace capacities from 3,200 to 5,000 cu m and oxygen converter capacities from 180 to 300 t provide not only greater production volume (twice the volume of steel melting) but also better overall technical and economical indices, i.e. greater labor productivity and lower prime metal costs. The organizational shortcomings are the restricted building trust resources so that actual erection of the launching complexes will take a number of years. Author

N77-12176 National Lending Library for Science and Technology, Boston Spa (England).
ZONAL ENERGETICS BALANCES FOR THE MELTING OF CARBON FERROCHROMIUM
Ya. I. Ostrovskii and V. P. Vorobev 1975 15 p refs Transl. into ENGLISH from Stal (USSR), no. 11, 1975 p 1004-1007
(NLL-M-25334-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Energetics balances were compiled for the bath of a 14 MVA enclosed electric furnace used for melting carbon ferrochromium, for three zones: (2) molten slag; (3) solid-gas phase reduction; and (4) preparation of charge materials (in zone (1) of metal there was practically no heat transfer). The maximum amount of Joule heat was generated in the slag zone; practically no heat was generated in zone 4. Most of the heat was consumed on heating the materials in zone 4. Supplying the charge materials after preheat, using partially reduced pellets, did provide a considerable saving of heat. The greatest demand for heat was in zone 3. To increase the amount of heat generated in this zone the ratio of voltage to phase current was increased to 1.75 V/kA. Author

N77-12177 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF STRESS CORROSION OF INCONEL 600 AND INCOLOY 800 FOR STEAM GENERATORS
L. Grall 8 Jun. 1976 37 p refs Transl. into ENGLISH from French Report Presented at IAEA Meeting, Palo Alto, Calif., 29-31 Mar. 1976
(BLL-Risley-TR-3038-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Stress corrosion cracking of 18/10 type stainless steel and Inconel 600 is discussed. Austenitic alloys containing 35% nickel are studied for sensitivity to cracking at 350 deg, in pure water or water contaminated by chlorides and caustic solutions. Author

N77-12178# Kyoto Univ. (Japan).
CATHODIC PROTECTION IN CORROSION FATIGUE OF AN Al-Zn-Mg ALLOY
Kichiro Endo, Kenjiro Komai, and Yoshinori Watase (Kawasaki Heavy Industry, Ltd.) 1976 6 p refs Reprint from the Proceedings of the 19th Japan Congress on Materials Research, (Kyoto), 1976 p 71-76
Avail: NTIS HC A02/MF A01

Corrosion fatigue tests of a high strength aluminum alloy were carried out in saline. The influences of cathodic potential on the initiation and the propagation of fatigue cracks were discussed from an electron microscopic observation of surface morphology and of fractured surfaces. Author

N77-12179# Lockheed Missiles and Space Co., Palo Alto, Calif.
EVAPORATION AND SURFACE ENERGY OF A METAL DEPOSITED IN A DISCONTINUOUS THIN FILM
F. Piuz [1976] 6 p refs Transl. into ENGLISH of conf. paper from Phys. Lab. of the Polytech. School of Lausanne Univ., Switzerland Presented at Probl. in Thin Film Phys. Proc. Intern. Symp. in Gottingen, West Germany, 6-11 Sept. 1965
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Illinois 60616

The behavior of a thin discontinuous metal film heated in a vacuum is theoretically studied. The experimental conditions permitting the mechanism of film evolution to be made apparent and the surface energy of the metal at temperatures below the melting point are considered. Author

N77-12180*# Scientific Translation Service, Santa Barbara, Calif.
PROCESS FOR MANUFACTURE OF STABLE HIGHLY PURE METALS WHICH FORM GASEOUS HYDRIDES, SUCH AS SILICON OR GERMANIUM, BY MEANS OF ELECTRICAL DISCHARGES
Claude Michel Cherrier Washington NASA Sep. 1976 12 p Transl. into ENGLISH from German Patent 1,047,175, 24 Dec. 1958 p 5
(Contract NAS7-100)
(NASA-TT-F-16763) Avail: NTIS HC A02/MF A01 CSCL 11F

The invention concerns a method for manufacture of highly pure metals forming stable gaseous hydrides, such as silicon or germanium, by means of electrical discharges. The process of the invention is characterized by the fact that the hydride is decomposed by the action of high-frequency electrical discharges generated by induction without electrodes. To carry out the process of the invention, it is preferable to use a reaction vessel through which the hydride flows under reduced pressure, which is exposed to an alternating electric field, without use of electrodes, so that electrical discharges are produced in the hydride. Frequencies in the long, medium, short, ultrashort, and even decimeter and centimeter ranges can be used to decompose the hydrides. One can use continuous discharges of undamped oscillations or pulse discharges. Author

N77-12181*# Battelle Pacific Northwest Labs., Richland, Wash.
DEVELOPMENT OF SPUTTERED HIGH TEMPERATURE COATINGS FOR THRUST CHAMBERS Final Report
R. Busch and M. A. Bayne 9 Aug. 1976 25 p
(Contract NAS3-19721)
(NASA-CR-135097) Avail: NTIS HC A02/MF A01 CSCL 11F

Adherent insulating coatings were developed for thrust chamber service. The coatings consisted of nickel and a ceramic, and were graded in composition from pure nickel at the thrust chamber wall to pure ceramic at the coating surface. The coatings were deposited by rf sputtering from a target with a reversed composition gradient, which was produced by plasma spraying powder mixtures. The effect of deposition parameters on coating characteristics and adherence is discussed. Author

N77-12182*# TRW Systems Group, Redondo Beach, Calif.
HEAT PIPE MATERIALS COMPATIBILITY Final Report
J. E. Eninger, G. L. Fleischman, and E. E. Luedke Jan. 1976 46 p refs
(Contract NAS3-19128)
(NASA-CR-135069; TRW-26148-6004-RU-00) Avail: NTIS HC A04/MF A01 CSCL 11F

An experimental program to evaluate noncondensable gas generation in ammonia heat pipes was completed. A total of 37 heat pipes made of aluminum, stainless steel and combinations of these materials were processed by various techniques, operated at different temperatures and tested at low temperature to quantitatively determine gas generation rates. In order of increasing stability are aluminum/stainless combination, all aluminum and all stainless heat pipes. One interesting result is the identification of intentionally introduced water in the ammonia during a reflux step as a means of surface passivation to reduce gas generation in stainless-steel/aluminum heat pipes. Author

N77-12183*# Alabama Univ., Huntsville. School of Science and Engineering.
LOW-GRAVITY PROCESSING OF SUPERCONDUCTING COMPOUNDS Final Report, 15 Dec. 1975 - 31 Oct. 1976
Guenther H. Otto Nov. 1976 45 p refs
(NASA-CR-150106; UAH-RR-194) Avail: NTIS HC A03/MF A01 CSCL 11F

Low gravity conditions can be sustained on earth for several seconds in an evacuated drop tube. Because radiation cooling is most effective at high temperatures, the refractive metals and alloys are prime candidates for free fall solidification. The results of initial experiments on droplet formation, droplet release, critical size and evaporation losses are given. The time required for free fall solidification of different size droplets is calculated. The materials studied were copper, niobium and vanadium, and a niobium-tin alloys. Improvements in purity, composition, homogeneity and stoichiometry are expected during free fall solidification of niobium based alloys which should become evident in an increase in the superconducting transition temperature. Author

N77-12184*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF A CHROMIUM-CONTAINING FUEL ADDITIVE ON HOT CORROSION
Carl E. Lowell and Daniel L. Deadmore Jul. 1976 30 p refs
(NASA-TM-X-73465; E-8831) Avail: NTIS HC A03/MF A01 CSCL 11F

Four superalloys were tested at 900 C in high velocity combustion gases containing synthetic sea salt and, in some cases, a chromium containing fuel additive. While the additive reduced hot corrosion of the alloys over the 100 hour test period, the attack was not eliminated nor was the mode of attack changed. Reduction of the number of thermal cycles had as large a beneficial effect as the Cr additive. Intermittent washing during testing had either small beneficial or adverse effects depending on the alloy. Author

N77-12185*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIRECTIONALLY SOLIDIFIED IRON-BASE EUTECTIC ALLOYS
Surendda N. Tewari Washington Dec. 1976 25 p refs
(NASA-TN-D-8354; E-8846) Avail: NTIS HC A02/MF A01 CSCL 11F

Pseudobinary eutectic alloys with nominal compositions of Fe-25Ta-22Ni-10Cr and Fe-15.5Nb-14.5Ni-6.0Cr were directionally solidified at 0.5 centimeter per hour. Their microstructure consisted of the fcc, iron solid-solution, matrix phase reinforced by about 41-volume-percent, hcp, faceted Fe2Ta fibers and 41-volume-percent, hcp, Fe2Nb lamellae for the tantalum- and niobium-containing alloys, respectively. The microstructural stability under thermal cycling and the temperature dependence of tensile properties were investigated. These alloys showed low elevated-temperature strength and were not considered suitable for application in aircraft-gas-turbine blades although they may have applicability as vane materials. Author

N77-12186# European Space Agency, Paris (France).
INVESTIGATION OF THE STRESS CORROSION CRACKING SUSCEPTIBILITY OF THE ALLOY AlZnMgCu 1.5 WITH REGARD TO ELECTROCHEMICAL AND METALLURGICAL ASPECTS
Guenter Mierke Oct. 1976 97 p refs Transl. into ENGLISH of "Untersuch. der Spannungsrisskorrosionsempfindlichkeit der Legierung AlZnMgCu 1.5 unter Beachtung elektrochem. u. met. Gesichtspunkte", DFVLR, Cologne Report DLR-FB-76-29, 7 May 1976 Original report in GERMAN previously announced as N76-33320 Original German report available from DFVLR, Cologne DM 36.50
(ESA-TT-336; DLR-FB-76-29) Avail: NTIS HC A05/MF A01

Investigations were made by the method of constant strain rate. Stress-elongation curves were taken in the electrolyte. Parameters were ultimate tensile stress, uniform elongation, relative fracture energy, and reduction of area of fracture. Electrochemical and metallurgical factors, for example, constant electrode potential, defined surface layers, alloy composition, test direction, and additions to the electrolyte were varied.
Author (ESA)

N77-12187# European Space Agency, Paris (France).
SPECIFIC HEAT OF DILUTE TRANSITION ALLOYS
Rene Caudron Nov. 1976 94 p refs Transl. into ENGLISH of "Chaleur Specifique d'Alliages Dilues de Transition", ONERA, Paris Report ONERA-P-1976-2, 1976 Original report in FRENCH previously announced as N77-10930
(ESA-TT-353; ONERA-P-1976-2) Avail: NTIS HC A05/MF A01

The electronic specific heat of dilute alloys of transition metals in nickel was studied: a strong increase in the electronic specific heat is evident when the virtual bound level lifted from the d vector up band by the impurity potential occurs at the Fermi level. Dilute solutions of carbon in nickel-iron and nickel-cobalt alloys were examined. Measurements suggest that the main part of the screening is provided by the spin vector down band which occurs at the Fermi level. The specific heat of dilute alloys of iron in molybdenum are also discussed. These alloys, although they have a transition metal matrix, behave as spin glasses, and are distinguished from the best known spin glasses, which have a noble metal matrix, by a small value of the interaction parameter and by abnormally low temperatures for the susceptibility maxima. Comparison between the behavior of the specific heats at high and low temperatures appears to justify the Blandin-Marshall model, although based on an Ising model. Author (ESA)

N77-12188# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
SURFACE CHARACTERIZATION OF TITANIUM AND TITANIUM ALLOY. PART 1: EFFECT ON TITANIUM-6 ALUMINUM-4 VANADIUM ALLOY OF COMMERCIAL TREATMENTS Final Report, Jun. 1975 - Jan. 1976
W. L. Baun Mar. 1976 48 p refs
(AF Proj. 7340)
(AD-A025334; AFML-TR-76-29-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report describes a study using a combination of ion scattering spectrometry (ISS) and secondary ion mass spectrometry (SIMS) along with scanning electron microscopy (SEM) to determine chemistry and morphology of surfaces produced by commercial treatments on Ti-6Al-4V alloy. Treatments include alkaline clean, alkaline etch, phosphate-fluoride, Pasa-Jell 107 and Vought Abrasive Slurry Treatment (VAST). GRA

N77-12189# Watervliet Arsenal, N.Y.
LITERATURE REVIEW: IMPACT TOUGHNESS OF BAINITE VERSUS MARTENSITE
Edwin H. Niccolls Apr. 1976 30 p
(AD-A025858; WVT-TR-76012) Avail: NTIS HC A03/MF A01 CSCL 11/6

A review of the literature is conducted with regard to the mechanical properties of bainite vs. martensite. Tempered martensite is found to have generally superior mechanical properties for lower (less than .5%) carbon content steels, but two specific bainitic heat treatments are described which may yield optimum properties. Author (GRA)

N77-12190# Cambridge Univ. (England). Dept. of Metallurgy and Materials Science.
SEGREGATION EFFECTS AND THE TOUGHNESS OF HIGH-STRENGTH STEELS Annual Technical Report
J. Q. Clayton and J. F. Knott Jan. 1976 43 p refs
(Contract DAJA37-74-C-1309; DA Proj. 1T1-61102832D)
(AD-A025299; ATR-2) Avail: NTIS HC A03/MF A01 CSCL 11/6

The tendency for Sb, P and Mn to segregate in austenite and produce embrittlement in as-quenched steels has been investigated. Sb does not appear to segregate appreciably in the austenite phase, but pure steels re-melted with 0.12%P exhibit intergranular fractures after quenching from 900 and 1000C. Quench rate experiments suggest that P segregates in austenite, rather than during the quenching process. Mn does not embrittle as-quenched pure steels, but results from steels containing Mn-P indicate that Mn interacts with P in austenite producing more severe embrittlement than P alone. The influence of heat treatments above 1150C on the distribution of MnS particles is being studied by metallography. Fine MnS-type particles are observed on the austenite boundaries in rapidly quenched

specimen. Grain boundary migration effects are considered to be responsible for the presence of the particles, however, precipitation effects cannot be eliminated as a possibility at this stage. The effects of Ni and Sb content on the susceptibility of Ni-Cr steels to temper embrittlement have been studied. Transition temperature and Auger results are presented for 0.5 and 5Ni steels containing up to 200 ppmSb. At 520C, grain boundary compositions reach equilibrium levels after approximately 100 hr. The degree of embrittlement and the extent of Sb segregation are much lower than would be expected from experiments with steels of higher Sb content. This effect is explained in terms of the Ni-Sb interaction. It is concluded that impurity content is a very important variable in systems where impurities and alloying elements interact. GRA

N77-12191# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
HARDENING CHARACTERISTICS OF Ti-2Sn-4Zr-6Mo ALLOY Final Report, Jun. 1970 - Feb. 1976
J. A. Hall, C. M. Pierce, J. R. Myers, and P. R. Grimes Apr. 1976 52 p refs
(AF Proj. 7351)
(AD-A025307; AFML-TR-76-23) Avail: NTIS HC A04/MF A01 CSCL 11/6

Research was conducted to develop heat treatments for Ti-6Al-2Sn-4Zr-6Mo alloy which have potential for minimizing microstructural and mechanical property variations in geometrically nonuniform components. Microstructure was found to be strongly dependent upon both the solution heat treating temperature and the cooling rate; solution heat treatments using two steps at differing temperatures appeared to minimize these differences. Certain heat treating conditions formed subgrain networks, called SERB, in the microstructure. Two maxima appeared to exist in the aging response curve for slowly cooled specimens aged at 1100 F; a potential mechanism for this phenomena was postulated. Fracture toughness was found to be inversely proportional to the amount of primary alpha phase present when relatively coarse acicular alpha exists. The fracture toughness for thick sections increased as the spread in the value of TUS-TYS increased. The best combination of mechanical properties obtained in the short transverse direction at the center of a 3-inch diameter, simulated, air-cooled component was: tensile yield strength, 158 ksi; ultimate tensile strength, 167 ksi; fracture toughness, 36 ksi(square root of(in)); and reduction in area, 37%. These properties were obtained using a two-step solution heat treatment consisting of 1700 F/1hr/SC + 1550 F/1hr/SC; aging was 8 hours at 1100 F. Author (GRA)

N77-12192# Systems Science and Software, La Jolla, Calif.
MODIFIED GRAY: AN IMPROVED THREE-PHASE EQUATION OF STATE FOR METALS Final Report
William O. Wray and Robert A. Cecil Aberdeen Proving Ground, Md. BRL Apr. 1976 119 p refs
(Contract DAAD05-74-C-0770; DA Proj. 1W1-62113-A-659)
(AD-A025260; SSS-R-76-2753; BRL-CR-299) Avail: NTIS HC A06/MF A01 CSCL 11/6

An improved version of the GRAY three-phase equation of state for metals is presented in this report. The Grover model for liquid metals is modified by employing a single continuous representation of the specific heat thereby eliminating the somewhat artificial hot liquid region. A soft sphere representation is incorporated into the modified van der Waals equation of state for the vapor region yielding a model which is physically realistic at high temperatures and more compatible with the Grover model. A continuous and thermodynamically consistent join procedure is inserted between the Grover liquid and van der Waals vapor regions. This new join procedure does not distort the van der Waals model in the vicinity of the critical point and allows the vapor to limit correctly at high temperatures and volumes. Author (GRA)

N77-12193# Pratt and Whitney Aircraft, East Hartford, Conn.
INFLUENCE OF SUBSURFACE DEFECTS ON FATIGUE PROPERTIES OF TITANIUM ALLOYS Annual Report, Oct. 1975 - Apr. 1976
C. C. Law and M. J. Blackburn 21 Apr. 1976 75 p refs
(Contract F33615-75-C-5138; AF Proj. 7353)
(AD-A025892; PWA-75-200-4017-2; AR-1) Avail: NTIS HC A04/MF A01 CSCL 11/6

Few manufacturing processes are perfect and errors, minor changes in a processing cycle, etc., can lead to defective regions in a product which may influence service performance. Over the past decades the demands of high technology areas such as these in the aerospace industry have required that such defects be eliminated from components and the advances in quality control, NDI, etc., have proved in general very successful in improving product integrity. Titanium alloys have formed part of such programs and the service record of these materials has been excellent. However, occasional problems have been encountered especially when the defects occur on a small scale and are difficult to detect by NDI techniques. Description of the types of defects that have been encountered were identified in the first semi-annual report. This has been used to establish an experimental and analytical program designed to gain insight into the nature and effect of two specific defects on subsequent mechanical properties. GRA

N77-12194# Grumman Aerospace Corp., Bethpage, N.Y.
FRACTOGRAPHIC EVALUATION OF FRACTURE SPECIMENS Final Technical Report, 15 Mar. - 31 Oct. 1975
P. D. Bell and W. J. Feeney Mar. 1976 203 p refs
(Contract F33615-75-C-3042; AF Proj. 486U)
(AD-A025746; AFFDL-TR-75-152) Avail: NTIS HC A10/MF A01 CSCL 11/6

This fractographic study of 2219-T851 aluminum and Ti 6Al-4V titanium was undertaken to investigate crack growth interaction effects in greater detail than was possible macroscopically. The specimens examined had been tested during the Crack Growth Analysis for Arbitrary Spectrum Loading Program, Air Force Contract No. F33615-72-C-1744. The transmission electron microscope was used for most measurements obtained. It was concluded that there is a one-for-one relationship between striations and loading cycles for the approximate striation size range from 1 to 50 micro inch. It was shown that striation spacing data, obtained along the centerline and edges of the fracture faces, correlated closely with macroscopic data obtained from the specimen surfaces. The plane strain plastic zone diameter described the overload affected crack length for specimens tested under plane strain conditions. The existence of delayed retardation was neither confirmed nor denied by this study, but a theory using plasticity and internal growth was proposed to explain delayed retardation as a surface phenomenon. The ratio of the closure level after one overload cycle to the stabilized closure level for the overload, decreased with increasing overload ratio. This ratio was larger for titanium than for aluminum at a given overload ratio. A local increase in striation spacing just prior to an overload was credited to stretching of the existing fracture surface by the overload. The stretch bands produced by the first few consecutive overload cycles were found to be much greater than could be calculated. GRA

N77-12195# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
THE INFLUENCE OF HEAT TREATMENT ON THE STRUCTURE AND PROPERTIES OF AN ISOTHERMALLY FORGED Ti6-Al-6V-2Sn NOSE WHEEL AND STRUCTURAL SHAPE Final Technical Report, Jun. 1972 - Dec. 1974
William R. Kerr Jan. 1976 59 p refs
(AF Proj. 7351)
(AD-A025473; AFML-TR-75-196) Avail: NTIS HC A04/MF A01 CSCL 01/3

Two isothermal forgings, an F111 nose wheel and a structural shape were sectioned, heat treated and evaluated by metallography and by tensile and fracture toughness tests. Results indicate reasonable uniformity of structure and properties throughout the isothermal forgings, and heat treatment response similar to that of conventional forgings of the same alloy. The as-forged microstructure is largely dependent on the preform microstructure. Author (GRA)

N77-12196# Cincinnati Univ., Ohio. Metals and Ceramics Div.
CONSOLIDATION OF BETA 3 TITANIUM ALLOY SPHERICAL METAL POWDERS BY HOT SWAGING Final Report, Feb. 1974 - Jul. 1975
N. C. Birla, V. DePierre, and A. M. Adair Wright-Patterson

AFB, Ohio AFML Mar. 1976 35 p refs
(Contract F33615-73-C-5097; AF Proj. 7351)
(AD-A025469; AFML-TR-76-22) Avail: NTIS
HC A03/MF A01 CSCL 11/6

The Air Force Materials Laboratory Tube Swaging Method was utilized for determining the processing parameters for producing fully consolidated products from Beta III titanium alloy spherical powders. Four temperatures (732 C, 760 C, 871 C and 954 C) and four percentage reductions (25.1, 37.5, 54.2, and 65.2) of the tube outside diameter were selected to study the consolidation effects of processing parameters. Fully consolidated powder products were obtained by 54.2 and 65.2 percent reductions at all four temperatures and by 37.5 percent reduction at 954 C. The other processing conditions did not give fully dense products. Room temperature tensile and fracture toughness properties of the swaged powder products in the heat treated conditions were determined. The fully consolidated swaged powder products had tensile and fracture toughness properties equal to or better than reported properties of wrought products made from ingot Beta III titanium alloy. The properties of the other swaged powder products (not fully dense) reflected lower mechanical properties because of poor consolidation.
Author (GRA)

N77-12197# Aluminum Co. of America, Alcoa Center, Pa.
IMPROVEMENT OF RELIABILITY AND THE MECHANICAL PROPERTIES OF TITANIUM ALLOY FORGINGS Final Report, Apr. 1972 - Dec. 1975
Thomas B. Gurganus and George S. Hall (RMI Co., Niles, Ohio) Dec. 1975 441 p refs
(Contract F33615-72-C-1030; AF Proj. 120-2)
(AD-A025479; AFML-TR-75-211) Avail: NTIS
HC A19/MF A01 CSCL 11/6

A series of fabrication and heat treatment sequences were evaluated to develop processing cycles that optimized property levels in Ti-6246 and Ti-38644 hand forgings. Die forgings were then produced using the optimum process for each alloy to demonstrate that reliable and consistent property levels could be obtained in airframe structural parts. The Ti-6246 optimum process consisted of forging at 1725 F, heat treating 4 hours at 1685 F, solution treating 4 hours at 1525 F, and aging 8 hours at 1100 F with an air cool after each operation. Consistent strengths and ductilities were obtained throughout 4 to 10-in. cross sections which were higher than currently available in other alpha-beta titanium systems. Good combinations of fatigue endurance limits, stress corrosion cracking thresholds, fracture toughness, thermal stability, and resistance to cyclic crack growth rate were also developed. The Ti-38644 optimum process consisted of forging at 1500 F, heat treating at 1500 F, and aging 4 to 12 hours at 950 to 1150 F with an air cool after each operation. Excellent transverse ductilities and good fracture toughness values were obtained at high yield strengths. Fatigue endurance limits, stress corrosion cracking thresholds, and resistance to cyclic crack growth rate were equivalent to or higher than other beta alloy systems. These property levels make the Ti-6246 and Ti-38644 systems excellent candidates for thick section airframe applications. Author (GRA)

N77-12198# Kawecki Berylco Industries, Inc., Reading, Pa.
FABRICATION AND EVALUATION OF HOT ISOSTATICALLY PRESSED BERYLLIUM Final Technical Report, Jul. 1974 - Oct. 1975
G. J. London and W. G. Lidman Jan. 1976 20 p refs
(Contract F33615-75-C-5041; AF Proj. 7381)
(AD-A024780; AFML-TR-75-213) Avail: NTIS
HC A02/MF A01 CSCL 11/6

The production of beryllium substructure was undertaken as part of the Carbon-Carbon Design Program (CCDP). Because of a change in beryllium requirements, the program was delayed and then redirected. A study of machining and etching of internal and external threads was started, and was terminated prior to the evaluation of parts produced. Four cylinders and one hollow cone frustum were made by direct hot isostatic pressing of electrolytic grade beryllium powder. Mechanical properties of the cylinders are reported and met the requirements established for the material. GRA

N77-12199# Dreher (John J.), Arcadia, Calif.
NEW APPROACHES TO TITANIUM ALLOY MICROSTRUCTURE-PROPERTY CHARACTERIZATION Final Report, Feb. 1975 - May 1976
John J. Dreher and Mark Rosenblum Wright-Patterson AFB, Ohio AFML Mar. 1976 69 p refs
(Contract F33615-75-C-5169; AF Proj. 7353)
(AD-A025734; AFML-TR-76-39) Avail: NTIS
HC A04/MF A01 CSCL 11/6

This report, in three sections, contains (1) a statistical sampling technique for determining photomicrograph homogeneity and replicability, (2) an optical structure-detection method using the stroboscope and color-separated prints, and (3) an opti-acoustical procedure for translating microstructure into sound. Also included is a description for a multiple platform turntable for simultaneous viewing of several photomicrographs. Significant and high correlations among microstructures and several mechanical properties are shown. Author (GRA)

N77-12200# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
SURFACE ANALYSIS OF 6061 AND 7050 ALUMINUM ALLOYS AFTER CONDITIONING BY CHEMICAL TREATMENT Final Report, Jan. - Aug. 1975
Neil T. McDevitt, William L. Baun, and James S. Solomon (Dayton Univ. Research Inst.) Mar. 1976 47 p ref
(AF Proj. 7340)
(AD-A025736; AFML-TR-76-13) Avail: NTIS
HC A03/MF A01 CSCL 11/6

This investigation was carried out to determine the effect of various chemical treatments on the surface of 6061-T6 and 7050-T76 bare aluminum alloys. After treatment various chemical elements can be found on the surface arising from the alloy constituents, the chemical solution or tap water rinse. The chemical signature of each surface should be known to assess adhesive bond durability. Author (GRA)

N77-12201# Pennsylvania State Univ., University Park. Applied Research Lab.
HOT CORROSION AND OXIDATION STUDIES OF PURE NICKEL AND Ni-Cr, Ni-Si AND Ni-Cr-Si ALLOYS AT 1000 C M.S. Thesis
Thomas W. Kerr 17 Sep. 1975 126 p refs
(Contract N00017-73-C-1418)
(AD-A024708; TM-75-246) Avail: NTIS HC A07/MF A01 CSCL 11/6

Oxidation and 'hot corrosion' studies were made at 1,000 C on pure Ni, Ni-Cr, Ni-Si and Ni-Cr-Si. Oxidation of the pure Ni and Ni-Cr alloys followed Wagner's parabolic relationships quite closely while the oxidation rates of Ni-Si alloys, with Si contents varying up to 10 wt%, varied in a relatively erratic manner as Si contents were increased. At high Si contents in these alloys, rates of oxidation were considerably reduced. In the ternary alloys, Ni-10Cr-1Si displayed an almost unique resistance to oxidation. X-ray and microprobe studies were made on the scales developed in both the oxidation and 'hot corrosion' studies. Although it was felt that the resistance of the high silicon alloys was primarily due to the formation of SiO2, no direct evidence for this phase was found in either the x-ray or microprobe studies. Thus, it appears that relatively thin layers, of SiO2 or other phases, are responsible for the inertness of these alloys. GRA

N77-12202# National Bureau of Standards, Washington, D.C.
PROGRESS REPORT ON THE CORROSION BEHAVIOR OF SELECTED STAINLESS STEELS IN SOIL ENVIRONMENTS Progress Report, 1970 - 1974
W. F. Gerhold, E. Escalante, and B. T. Sanderson Aug. 1976 78 p refs Prepared for Am. Iron and Steel Inst., Washington, D. C.
(PB-256329/4; NBSIR-76-1081) Avail: NTIS
HC A05/MF A01 CSCL 11F

The effect of burial in representative soils on the corrosion and stress corrosion of stainless steels is investigated. Test materials include coated and uncoated sheet specimens in the annealed and sensitized condition, uncoated welded tubing specimens and galvanically coupled and uncoupled stressed and unstressed specimens. To date approximately 10,000 specimens

have been buried at six soil test sites. Results obtained for specimens buried for up to approximately four years are given. GRA

N77-12203# National Bureau of Standards, Washington, D.C.
SHIP STEEL WELDMENTS FOR LOW TEMPERATURE SERVICE Final Report
H. I. McHenry May 1976 9 p refs Submitted for publication Sponsored by Maritime Administration, Washington D. C.
(PB-256997/8) Avail: NTIS HC A02/MF A01 CSCL 11F

The ship steels, welding practices and weldment toughness requirements applicable to low temperature regions of liquefied-natural-gas (LNG) tankers are reviewed. In the construction of LNG ships, the principal welding productivity problem is the low deposition rate associated with the low heat input welding practices required to provide sufficient toughness in the weld heat-affected-zone (HAZ). A potential solution to this problem is to use improved steels which can be welded using efficient procedures and still provide satisfactory HAZ toughness. The steelmaking practices that contribute to low temperature toughness are reviewed with respect to economic limitations associated with ship steels and to their potential for improving HAZ toughness. GRA

N77-12204# British Steel Corp., Sheffield (England). Information Services.
THE DETERMINATION OF TRACE AMOUNTS OF ALUMINIUM, BISMUTH, CHROMIUM AND ANTIMONY IN STEELS BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY
M. E. Hofton Jun. 1976 17 p refs
(PB-256053/0; GS/TECH/558/2/76/C) Avail: NTIS HC A02/MF A01 CSCL 11F

A method developed for the determination of trace amounts of aluminum, antimony, bismuth and chromium in iron and steel is described. The procedure using atomic absorption spectrophotometry in conjunction with a heated graphite atomizer allows the determination of the metals at levels below 0.01% and is interference free. The technique involves dissolution of the steel in sulphuric acid and analysis times are comparable in length to those for corresponding flame atomic absorption methods. GRA

N77-12205# British Steel Corp., Sheffield (England). Information Services.
DETERMINATION OF CORRECTION FACTORS BY REGRESSION ANALYSIS FOR THE ANALYSIS OF SULFUR USING OPTICAL EMISSION SPECTROMETRY
A. Butterworth and M. Hunt Jun. 1976 12 p refs
(PB-256052/2; GS/TECH/MISC/117/75/C) Avail: NTIS HC A01/MF A01 CSCL 11F

Optimum operating conditions on modern optical emission instruments used for rapid analysis in production control do not coincide with those required for the analysis of sulfur and interferences tend to be accentuated. Regression analysis was used to determine factors to correct for interferences by carbon and manganese. Unlike other applications of regression analysis where improvement in fit of the data is taken as a measure of success of the correction factors, a separate set of samples was examined and a significant improvement was observed. Eighty percent of these fall within + or - 0.002 percent of the calibration line and, most important from an operating point of view, bath and pit samples are incorporated on the same calibration line. GRA

N77-12206# Army Materials and Mechanics Research Center, Watertown, Mass.
ON THE EMBRITTLEMENT OF GRAIN BOUNDARIES BY IMPURITIES Final Report
Gordon A. Bruggeman Mar. 1976 18 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-A024940; AMMRC-TR-76-7) Avail: NTIS HC A02/MF A01 CSCL 11/6

The segregation of impurities to grain boundaries is shown to produce a reduction in the grain boundary energy, but that this does not necessarily coincide with a tendency toward embrittlement caused by decohesion. Indeed, it is shown that only when certain relationships occur between the composition dependence of the surface and grain boundary energies can there be a true decohesion of the boundary. The criterion for embrittlement, based on boundary decohesion, requires that the ratio of the changes in surface and boundary energies increases with concentration of the impurty, or equivalently, that the ratio of the amount of impurity segregated to the surface to the amount of impurity segregated to the boundary increases with increasing impurity concentration. However, since impurity segregation to grain boundaries occurs independent of whether or not decohesion results, an effect of impurities in the vicinity of the grain boundary on localized plasticity is likely to be the dominant factor in intergranular embrittlement of otherwise ductile materials. Author (GRA)

N77-12207# Rockwell International Science Center, Thousand Oaks, Calif.
FATIGUE CRACK GROWTH IN ALUMINUM ALLOYS Final Report, 1 Jan. - 31 Dec. 1975
J. D. Frandsen 27 Feb. 1976 15 p refs
(Contract F44620-75-C-0018; AF Proj. 9761)
(AD-A025196; SC5008.2F; AFOSR-76-0538TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

The objective of this investigation was to further the understanding of the mechanisms by which fatigue crack propagation occurs in aluminum alloys. Two basic techniques were used to investigate and simulate the events occurring within the plastic zone preceding fracture. The plastic deformation occuring within the plastic zone of the crack tip was simulated by low cycle fatigue tests. These tests were largely unsuccessful because of the significant influence the crack initiation stage has on fatigue life and a relative insensitivity to environmental effects. The response of the crack tip to tensile holds was determined by acoustically determined crack closure measurements. The limited results reported here were encouraging, and the crack closure investigation offers possibilities of describing the fatigue cracks' response to simple loading spectra. Author (GRA)

N77-12208# Watervliet Arsenal, N.Y.
VARIATION OF MECHANICAL PROPERTIES IN LARGE STEEL FORGINGS
Peter Thornton and Vito J. Colangelo Apr. 1975 64 p refs
(AD-A025807; WVT-TR-75019) Avail: NTIS HC A04/MF A01 CSCL 11/6

In a continuing effort to determine the causes of mechanical property variation in large steel forgings, the effects of forging reduction on mechanical and metallurgical properties were examined. The related work previously conducted at Watervliet has been appropriately summarized in a recent report, WVT-TR-74001. The present study deals specifically with the metallurgical consequences of solidification and mechanical working. Accordingly, the aspects of nonmetallic inclusions, chemical homogeneity and microstructure were considered. For the range of forging reductions investigated (1.5:1 - 10:1); a reduction ratio of approximately 3:1 produced optimum average values in % RA, Charpy impact strength and fracture toughness. Also, the significant variations statistically determined in these parameters was accompanied by real variation in carbon concentration. Therefore, carbon segregation on a macroscale is shown to be a major contributor to mechanical property variation in large steel forgings. Author (GRA)

N77-12209# Brush Wellman, Inc., Cleveland, Ohio.
EFFECT OF INCLUSIONS ON THE MECHANICAL BEHAVIOR OF BERYLLIUM Final Technical Report, 15 Jun. 1974 - 15 Oct. 1975
D. B. King, S. H. Gelles, and T. Nicholas Wright-Patterson AFB, Ohio AFML Apr. 1976 114 p refs Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract F33615-74-C-5172; AF Proj. 7351)
(AD-A025968; AFML-TR-76-33) Avail: NTIS HC A06/MF A01 CSCL 11/6

Samples of hot pressed and hot isostatically pressed S-65 beryllium were prepared from billets salted with iron base and graphite particles. Quasistatic tension, biaxial disc, and internally pressurized ring tests were performed to evaluate the effects of the resultant inclusions on the mechanical properties of beryllium. Inclusions in salted billets were characterized and compared with those found in production pressings. Fracture surfaces at

inclusions were examined. Results indicate that inclusions degrade the mechanical properties of beryllium but not catastrophically. Surface inclusions were found to be more deleterious than internal inclusions. The salting technique was found to provide a convenient method for producing material for test specimens having inclusions of a predetermined type, size range, and number, which are representative of those found in production pressings.
Author (GRA)

N77-12210# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
EFFECTS OF IRON AND SILICON CONTENT ON STRESS CORROSION CRACKING IN A THERMOMECHANICALLY PROCESSED ALUMINUM ALLOY Final Technical Report, Aug. 1974 - Aug. 1975
Peter J. Blau Mar. 1976 42 p refs
(AF Proj. 7351)
(AD-A025165; AFML-TR-75-215) Avail: NTIS HC A03/MF A01 CSCL 11/6

A study of stress corrosion cracking in 7475 type aluminum alloy plates was conducted using five iron and silicon levels, chromium and zirconium minor additions, and two tempers: T651 and thermomechanical processing (TMP). The T651 specimens showed no clear effects of purity or minor addition on stress corrosion resistance; however, a large purity effect was seen in TMP specimens. As total iron and silicon content decreased from 0.31 to 0.02 weight percent, the 2000-hour threshold stress intensity about doubled in these alloys. In addition, TMP alloys showed a relationship between stress corrosion, threshold stress intensity, and precracked Charpy toughness.
Author (GRA)

N77-12211# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
ON THE ISOTOPE EFFECT IN HYDROGEN EMBRITTLEMENT OF NIOBIUM
S. Gahr and H. K. Birnbaum Apr. 1976 7 p refs
(Contract N00014-75-C-1012)
(AD-A025180) Avail: NTIS HC A02/MF A01 CSCL 11/6

The isotope effect on the embrittlement of Nb by H or D was studied using SEM fractographic techniques.
Author (GRA)

N77-12212# Frankford Arsenal, Philadelphia, Pa.
HIGH STRENGTH-HIGH DAMPING CAPACITY WROUGHT MAGNESIUM ALLOYS
Albert Zalcmann, Jeffrey Waldmann, and Milton Schwartz Oct. 1975 34 p refs
(DA Proj. 1T0-62105-AH-328)
(AD-A025164; FA-TR-75073) Avail: NTIS HC A03/MF A01 CSCL 11/6

An investigation was carried out to provide information regarding the alloying elements and the strengthening processes that must be utilized to obtain wrought magnesium alloys having high strength and high damping capacity for use in structural applications in missiles and aircraft. To this end, wrought magnesium alloys containing such solute elements as Al, Cd, In, Li, Mn, Pb, Y, Zn, and Zr were prepared and evaluated with respect to strength and damping capacity. The commercial alloy, AZ31, composite materials of magnesium containing borsic fibers, and a magnesium alloy strengthened by MgO particles were also evaluated. The effects of solute type and concentration, degree of cold work and grain size on the damping capacity of the alloys were investigated. An inverse relationship exists between damping capacity and the strength of the materials. This relationship holds for different types and concentrations of solute and for different degrees of cold work. The significance of this relationship is discussed. The Mg-Cd, Mg-Mn and Mg-Zr alloys have the highest damping capacity of the alloys investigated. Possible mechanisms for the strength-damping capacity behavior in wrought magnesium alloys are presented. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N77-12213 Vanderbilt Univ., Nashville, Tenn.
PREPARATION AND MAGNETIC PROPERTIES OF TITANIUM PHOSPHATE GLASS Ph.D. Thesis
Charles Hampton Perry 1976 203 p
Avail: Univ. Microfilms Order No. 76-22361

Chemical, physical and magnetic properties of reduced titanium phosphate glasses are reported. The glasses prepared and studied are represented by the general formula, XTiO(2-N)-P2O5, where X varies from 1.96 to 3.0 and N varies from 0.03 to 0.25. The chemical studies give evidence for a reaction between titanium metal (Ti(0)) or Ti(+3) and P2O5 at the glass melting temperature. Experimental results suggest that Ti(0) and Ti(+3) can reduce P2O5 to lower oxides of phosphorus at high temperatures. A mechanism is proposed for the reduction reaction. A quantitative technique was also developed for analyzing Ti(+3) in phosphate glass. Data on the physical properties of these glasses are presented from electron microscopy, X-ray diffraction and dilatometry measurements. Magnetic susceptibility data as a function of glass composition, temperature and magnetic field are also presented. Behavior typical for amorphous antiferromagnetism was observed. A microstructural model for the titanium phosphate glasses was developed and used to derive a theoretical magnetic susceptibility equation. Dissert. Abstr.

N77-12214 Massachusetts Univ., Amherst.
INTERACTIONS OF WATER WITH HYDROPHILIC POLYETHER POLYURETHANES Ph.D. Thesis
Joyce Lefever Illinger 1976 136 p
Avail: Univ. Microfilms Order No. 76-22264

Two series of polyurethanes based on MB1, butanediol and several block copolymer polyethers with varying proportions of poly(ethyleneoxide) PEO and poly(propyleneoxide) PPO have been synthesized. In series 1 the ratio of PEO to PPO is varied at fixed hard segment concentration. In series 2 the hard segment concentration is varied at a fixed 50/50 ratio of PEO to PPO. At constant hard block composition and decreasing amounts of PEO in series 1 polymers, water uptake decreases from approximately 60% in the polymer with pure PEO to approximately 2% for the polymer with PPO at 30 C. These amounts of uptake increase as the temperature is decreased. The decrease in water uptake is most marked under immersion conditions or when the sorption isotherm is measured at saturation conditions.
Dissert. Abstr.

N77-12215 Massachusetts Univ., Amherst.
OPTICAL STUDIES OF THE STRESS-INDUCED CRYSTALLIZATION OF RUBBERS Ph.D. Thesis
Mitsuaki Hashiyama 1976 275 p
Avail: Univ. Microfilms Order No. 76-22236

The change in the fraction crystallinity with time and elongation of synthetic cis-1, 4-polyisoprene (PIP) was studied through simultaneous measurement of birefringence and stress. Several theories for birefringence and stress were applied and examined for their applicability and limitations. Results from various methods were compared including the one from X-ray measurement. The method described here proved to be a sensitive and convenient method for determination of crystallinity of such samples. Thermal effects of rapid extension and crystallization were considered. For the case of PIP studied here, it was concluded that the effects were small and could be neglected.
Dissert. Abstr.

N77-12216 Polytechnic Inst. of New York.
MEASUREMENTS OF THE RHEOLOGICAL PROPERTIES OF MULTIPATH POLYMERIC SYSTEMS Ph.D. Thesis
Young Woo Kim 1976 180 p
Avail: Univ. Microfilms Order No. 76-23419

Measurements were taken of the rheological properties, both viscometric and non-viscometric, of multiphase polymeric systems. An attempt was made to offer a phenomenological explanation of the experimentally observed rheological behavior of multiphase

polymeric systems, with the aid of photomicrographs of the extrudate (or fiber) samples. The Han capillary/slit rheometer was used to determine the viscometric rheological properties, and the melt spinning apparatus was used to determine the elongational viscosity of the multiphase polymer systems investigated. The processing variables, such as flow rate and melt temperature, were varied in order to investigate their effects on the rheological properties. The effect of mixing on the rheological properties was also investigated by using three different mixing devices. They are: a single screw extruder, a single screw extruder together with static mixer, and a twin screw compounding machine. Dissert. Abstr.

N77-12217 Polytechnic Inst. of New York.
SIDE CHAIN CRYSTALLIZATION OF LONG SIDE CHAIN POLYMERS Ph.D. Thesis
Henry Wen-Shyong Hsieh 1976 154 p
Avail: Univ. Microfilms Order No. 76-23409

Crystallinity of atactic vinyl polymers was observed in some cases where the side chains such as long alkyl groups are crystallizable although the main chains may not participate in the crystallization. This phenomenon is known as side chain crystallization. The present work was concerned with side chain crystallization of the following types of polymers: (1) polymers with an ester linkage between a long paraffinic side chain and its main chain, (2) polymers having an amide group linking a long paraffinic side chain to the main chain, (3) polymers containing a second amide group in a side chain, in addition to the first one acting as a linkage between the side chain and its main chain, (4) copolymers of either n-octadecyl acrylate or n-octadecyl methacrylate with methyl acrylate, and (5) miscellaneous polymers with an aromatic side group linked with its main chain through an ester group. X-ray diffraction from oriented fibers was the main technique employed, accompanied by some infrared studies. Dissert. Abstr.

N77-12218*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BORON-EPOXY-REINFORCED TITANIUM AIRCRAFT LANDING-GEAR DRAG STRUT
William E. Howell Washington Nov. 1976 32 p refs
(NASA-TN-D-8289; L-10527) Avail: NTIS HC A03/MF A01 CSCL 13M

The structural performance of a boron-epoxy-reinforced titanium drag strut, containing a bonded scarf joint and designed to the criteria of a large commercial transport, has been evaluated experimentally and analytically. The strut was exposed to two lifetimes of fatigue loading and was statically loaded to the tensile and compressive design ultimate loads. Throughout the test program no evidence of any damage in the drag strut was detected by strain-gage measurements, ultrasonic inspection, or visual observation. The bonded joint was analyzed using the NASTRAN computer program. A comparison of the strains predicted by the NASTRAN computer program with the experimentally determined values shows excellent agreement. An analytical study indicated that the nonlinear behavior of a structural spacer at each end of the strut could be explained by the inelastic behavior and possible creep of the adhesive. Author

N77-12219# Physikalisch-Chemisches Forschungslabor, Munich (West Germany).
FURTHER DEVELOPMENT AND APPLICATION OF POLYCRYSTALLINE METAL WHISKERS Final Report
Hermann J. Schladitz Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1976 75 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-18) Avail: NTIS HC A04/MF A01; ZLDI, Munich, DM 15.35

Polycrystalline metal whiskers, also known as Schladitz whiskers, were studied. The optimal bonding of the polycrystalline whisker to a reinforcing matrix is dealt with. Improvement and adaptation of whisker manufacturing processes to the matrix fiber reinforcement requirement is discussed. Preparations of the mass production of improved or modified whisker types for the matrix reinforcement is dealt with. Procedures for the manufacturing of fiber reinforced materials using polycrystalline whiskers are presented. Methods for the production from whiskers of special material for solving actual scientific and technical problems, such as constructions of electrodes for batteries and fuel cells, catalysts, and heat exchanger material for highly efficient combustion, are given. ESA

N77-12220*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EFFECTS OF THE PHYSIOLOGICAL ENVIRONMENT ON THE LONG-TERM PHYSICAL PERFORMANCE OF POLYMERIC MATERIALS Annual Report, Dec. 1974 - Nov. 1975
J. Moacanin, R. Fedors, J. Ingham, E. Cuddihy, D. D. Lawson, and E. J. Roschke 22 Apr. 1976 69 p refs Sponsored by NASA
(Grant PHS-HV-30011)
(NASA-CR-149206; PB-255708/0; JPL-5040-31; NIH-Y01-HV-30011-3) Avail: NTIS HC A04/MF A01 CSCL 06L

An evaluation of the mechanical properties of a class of segmented polyether urethanes was completed. This included a study of the effects on properties of the extraction of the polymer with ethanol as of well as the details of conditions during casting. Thermal stability studies on the elastomer using mass spectrometer analyses for volatiles indicated reasonable resistance to steam sterilization. Studies were initiated on the surface erosion of hydrogel and carbon-coated surfaces using a rotating disc device. Methods for observing surface charges were developed. GRA

N77-12221# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
ELECTRICAL PROPERTIES OF POLYCRYSTALLINE CERAMIC INSULATORS
Ronald E. Loehman, Robert T. DeHoff, and G. Rama Rao Apr. 1976 32 p refs
(Contract N00014-75-C-0888)
(AD-A025312) Avail: NTIS HC A03/MF A01 CSCL 20/3

Various models developed to treat the electrical properties of heterogenous systems are briefly reviewed. It is asserted that none of these models can be adequately applied or tested for a particular material without an adequate, quantitative microstructural description. The microstructural parameters of interest for a two-phase system of grains, pores and grain boundaries are described. Polycrystalline Al2O3 has been chosen as a model system; a variety of samples with systematically related microstructures have been prepared by hot-pressing. AC electrical properties have been measured for some of these samples and microstructural analysis is underway. Correlations and the model testing will follow once sufficient microstructural data have been obtained. Author (GRA)

N77-12222# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
PRELIMINARY EVALUATION OF ATQ POLYMER AS A POTENTIAL MATRIX RESIN Final Technical Report, Jan. - Apr. 1975
Anthony Wereta, Jr. Feb. 1976 21 p refs
(AF Proj. 7340)
(AD-A025897; AFML-TR-75-214) Avail: NTIS HC A02/MF A01 CSCL 07/3

The Air Force Materials Laboratory (AFML), Polymer Branch research on acetylene terminated quinoxaline (ATQ) polymers has been extended to determine the potential of this newly discovered material as a matrix resin for reinforced composites. Preliminary investigations of mechanical properties of ATQ research samples have been conducted and the results compared with those obtained on the HR-600 resin which is under Air Force development. These preliminary findings and others indicate great potential for ATQ and that additional quantities should be made available for the fabrication and evaluation of composite test specimens. GRA

N77-12223# Dayton Univ., Ohio. Composite and Fibrous Materials Branch Lab.
BONDING OF ELEVATED TEMPERATURE STRAIN GAGES TO HUMID AGED GRAPHITE TENSILE SPECIMENS THROUGH THE USE OF ANAEROBIC ADHESIVES Technical Report, 1 May - 1 Oct. 1975
Charles C. Fowler, Jr. Wright-Patterson AFB, Ohio AFML Dec. 1975 33 p ref
(Contract F33615-75-C-5093; AF Proj. 7340)
(AD-A025920; AFML-TR-75-204) Avail: NTIS

HC A03/MF A01 CSCL 11/1

In order to study the effects of moisture on graphite composites at elevated temperatures, new techniques of adhesively bonding strain gages to test specimens had to be developed. All of the current elevated temperature strain gage adhesives require heat and pressure with varying lengths of time at temperature in order to cure. A room temperature curing, elevated temperature adhesive would be very desirable in order not to negate the moisture effects (dry-out the specimens) or further cure the specimens. The use of anaerobic adhesives was found to be the solution to this problem. New techniques were developed for gage application and other applications were found to utilize this adhesive's unique characteristics. Author (GRA)

N77-12224# National Bureau of Standards, Washington, D.C. Engineering Mechanics Section.

ENVIRONMENTAL EFFECTS ON THE STRENGTH OF A GLASS FIBER-REINFORCED-PLASTIC ROD MATERIAL Final Report

Nixon Halsey and Leonard Mordfin Mar. 1976 38 p refs Sponsored by USIA

(PB-256296/5; NBSIR-76-1069) Avail: NTIS HC A03/MF A01 CSCL 11D

Environmental stress-rupture test methods were developed for studying the weatherability of materials under stressed exposure to marine atmospheres and intense sunshine. These laboratory test methods were applied to a coated, pultruded, glass fiber-reinforced plastic rod product, with the marine atmosphere simulated by a saltwater fog and intense sunshine simulated by ultraviolet radiation. Static tests of the material, conducted both before and after the environmental exposures, were used to characterize both the received mechanical properties of the product and the reductions in tensile strength attributable to the weathering actions. The results essentially confirmed that the effects of sunlight and weathering on the product range from none to slight. For applications as antenna guys, the results suggest that the strength limitations imposed on rods by conventional end fittings, and by the fact that rods are frequently bowed rather than straight, tend to overshadow any strength reductions attributable to environments of the types considered. A failure analysis of a tower guy fabricated from this material is given. GRA

N77-12225# Northwestern Univ., Evanston, Ill. Materials Research Center.

PROCESSING OF POLYMERIC MATERIALS

Stephen H. Carr and Frank E. Karasz Sep. 1975 65 p refs Proc. of a Workshop held at Evanston, Ill., 21-23 Apr. 1974; Sponsored by NSF, Northwestern Univ. and Mass. Univ.

(Grant NSF DMR-72-03019)

(PB-255986/2; NSF/MRLC-74-02) Avail: NTIS HC A04/MF A01 CSCL 07C

The state-of-the-art and research projects are discussed in the following areas: fundamentals of polymer melt rheology, solidification of polymers during processing, unique possibilities in polymer rheology, molecular orientation in polymer solids, materials science of polymeric solids, processing of thermosetting resins, polymer processing in the communications industry, and scale-up problems in extrusion processes. Synopses of discussion following presentations in each area are included. GRA

N77-12226# Rockwell International Corp., Anaheim, Calif.

RELIABILITY OF DEPOSITED GLASS Final Technical Report, Mar. 1974 - Apr. 1975

J. E. Mann, W. E. Anderson, T. J. Raab, and J. S. Rollins Griffiss AFB, N. Y. RADC Mar. 1976 139 p refs

(Contract F30602-74-C-0160; AF Proj. 5519)

(AD-A024664; C75-266/201; RADC-TR-76-82) Avail: NTIS HC A07/MF A01 CSCL 09/5

Presented in this report is a study of the reliability of deposited glass used to protect the surface of integrated circuits and MOS devices. The devices studied were representatives of commercially available circuits used in military systems currently. A total of 793 devices were used for the study. They were purchased from six different suppliers and included linear integrated circuits, digital integrated circuits, PMOS circuits, and CMOS digital circuits. The devices contained either chemically vapor deposited silicon dioxide or electron beam evaporated quartz as glass protective layers. The devices had aluminum metallization systems. The deposited glass layers on these device types were characterized according to their electrical, chemical and structural properties. The stress behavior of the deposited glass was studied under various stress conditions which included thermal shock, temperature cycling, high temperature reverse bias, burn-in, and moisture resistance tests as specified in MIL-STD-883. Additional studies were made under other environments such as radiation, 260 C burn-in, and power on/off cycling. Detailed failure analysis was performed on all failures to identify and characterize failures that were associated with deposited glass layers. The behavior of the deposited glass layers on these devices was compared to devices used in military programs such as the Minuteman program. GRA

N77-12227# Naval Underwater Systems Center, Newport, R.I.

A STUDY OF THE DRAG CHARACTERISTICS AND POLYMER DIFFUSION IN THE BOUNDARY LAYER OF AN AXISYMMETRIC BODY Ph.D. Thesis - Rhode Island Univ., 1975

John E. Sirmalis 12 Mar. 1976 281 p refs

(NUSC Proj. A-385-10; ZR0000101)

(AD-A024667; NUSC-TR-4860) Avail: NTIS HC A13/MF A01 CSCL 20/4

Drag reduction by ejection of high molecular weight polymers on free-running bodies of revolution has been demonstrated repeatedly. The quantities of polymer required have made the gains achieved marginal from a volume utilization tradeoff. The ejection process is hypothesized to be the controlling factor. Limited data obtained in pipe flow and flat plate flow experiments on ejection into developing boundary layers indicate a drastic reduction in polymer requirements for equivalent percent drag reductions. Extension to axisymmetric flow could result in significant achievable gains to volume utilization. This study examines these polymer ejection processes through measurement of wall and boundary layer concentration profiles and through a photographic study of the boundary layer. Tests performed with fresh water ejection and solutions of the drag reducing polymer, Polyox WSR-301, lead to the hypothesis that optimal ejection for minimum polymer usage requires ejection into a laminar boundary layer prior to turbulent flow transition. Analytical routines are developed which predict boundary layer parameters and polymer wall concentrations for this postulated optimal ejection process or the suboptimal case. Limited verification of the model is made. Author (GRA)

N77-12228# Akron Univ., Ohio. Inst. of Polymer Science.

DEVELOPMENT OF HIGHLY ORIENTED POLYMERS WITH IMPROVED MECHANICAL PROPERTIES Final Report, Jun. 1973 - Jun. 1975

Eberhard A. Meinecke and Donald McIntyre Wright-Patterson AFB, Ohio AFML Dec. 1975 89 p refs

(Contract F33615-73-C-5113)

(AD-A024988; AFML-TR-75-178) Avail: NTIS HC A05/MF A01 CSCL 11/9

Highly oriented crystalline polymer films were prepared in several different ways. Mechanical properties of the film were examined experimentally and related to the theoretical expectations of strengths and moduli. The first general method adopted for producing oriented polymer films involves the crystallization of polyethylenes in dilute solutions under shear. The data indicate a trend towards greater orientation with increased shear rate; however, the films lack good physical integrity. Consequently the mechanical properties are low compared to theoretical expectations. The second general method adopted involves the simultaneous application of a shear field and high pressure on dilute solutions of polyethylene in a top-stirred high pressure reactor kept at constant stirring rates. The pressure varied from atmospheric to 400 C psi, and the stirring rate ranged from 110 to 380 rpm. The films had greater physical integrity than in the first method, but the dependence of the mechanical properties on the pressure and stirring rate is not clear. A third general method of obtaining highly oriented polymer film uses a very rigid polymer backbone structure. Semi-rigid cellulosic polymers and very stiff poly-(n-alkyl isocyanate) and poly-(-benzyl L-glutanate) films are described. The films are prepared using both ultra-thin film casting and melt extrusion. The orientation of these very stiff chains, particularly poly-(n-hexyl)

isocyanate, is found to be extremely high. Only small amounts of these polymers are available. However, the high crystallite orientation of these polymers suggests that they are more likely to produce desirable mechanical properties. GRA

N77-12229# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.
STRUCTURAL RELAXATION OF ENTHALPY AND HEAT CAPACITY OF As2Se3 GLASS
A. J. Easteal, J. A. Wilder, R. K. Mohr, and C. T. Moynihan Apr. 1976 29 p refs Presented at the 77th Annual Meeting of the Am. Ceramic Soc., Washington, D. C., 6 May 1975
(Contract N00014-76-C-0201)
(AD-A025018; TR-34) Avail: NTIS HC A03/MF A01 CSCL 11/2

Differential scanning calorimetry measurements of the enthalpy of As2Se3 glass during structural relaxation in the glass transition region have been carried out for two time-temperature programs: rate heating at 10K/min following a cool at a constant rate and isothermal annealing following a temperature step from an equilibrium state. The kinetic parameters for the structural relaxation assessed from the rate heating data gave an accurate prediction of the evolution of the enthalpy during isothermal annealing. The heat capacities of As2Se3 glasses cooled through the transition at rates ranging from -20 to 0.31 K/min were independent of cooling rate within experimental precision (0.2%). In this respect As2Se3 is unlike previously studied glasses, whose heat capacities show a more sizeable dependence on thermal history. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N77-12230*# Atlantic Richfield Co., Harvey, Ill. Technical Center.
SYNTHESIS AND ANALYSIS OF JET FUEL FROM SHALE OIL AND COAL SYNCRUDES
J. P. Gallagher, T. A. Collins, T. J. Nelson, M. J. Pedersen, M. G. Robison, and L. J. Wisinski 17 Nov. 1976 64 p refs
(Contract NAS3-19747)
(NASA-CR-135112; M1.76-1) Avail: NTIS HC A04/MF A01 CSCL 21D

Thirty-two jet fuel samples of varying properties were produced from shale oil and coal syncrudes, and analyzed to assess their suitability for use. TOSCO II shale oil and H-COAL and COED syncrudes were used as starting materials. The processes used were among those commonly in use in petroleum processing-distillation, hydrogenation and catalytic hydrocracking. The processing conditions required to meet two levels of specifications regarding aromatic, hydrogen, sulfur and nitrogen contents at two yield levels were determined and found to be more demanding than normally required in petroleum processing. Analysis of the samples produced indicated that if the more stringent specifications of 13.5% hydrogen (min.) and 0.02% nitrogen (max.) were met, products similar in properties to conventional jet fuels were obtained. In general, shale oil was easier to process (catalyst deactivation was seen when processing coal syncrudes), consumed less hydrogen and yielded superior products. Based on these considerations, shale oil appears to be preferred to coal as a petroleum substitute for jet fuel production. Author

N77-12231# Battelle Columbus Labs., Ohio.
FUEL CONTAMINANTS. VOLUME 1: CHEMISTRY Final Report, Jun. 1975 - Feb. 1976
E. J. Mezey, Surjit Singh, and D. W. Hissong Jul. 1976 179 p refs 2 Vol.
(Contract EPA-68-02-2112)
(PB-256020/9; EPA-600/2-76-177-a-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 21D

Information on the characteristics of solid and liquid fuels is reviewed. The chemical and physical characteristics of components of the fuel are dealt with which are sources of sulfur, nitrogen, and trace element pollutants when that fuel is utilized. Part of the sulfur and most of the nitrogen originate from compounds common to the fuels reviewed (coal, petroleum, tar sand oil, and shale oil). These are primarily organic sulfur and organic nitrogen compounds. For liquid fuels, intrinsic centers of sulfur and nitrogen contamination are found in the colloidal suspensions commonly known as asphaltenes and the more soluble resins. GRA

N77-12232# Naval Research Lab., Washington, D.C.
ELECTROSTATIC PROPERTIES OF JP-5 JET FUEL FROM ALTERNATE SOURCES
J. T. Leonard May 1976 9 p refs
(WF57571301)
(AD-A025684; NRL-MR-3294) Avail: NTIS HC A02/MF A01 CSCL 21/4

The electrostatic properties of JP-5 fuel from alternate sources were determined. Two properties electrical conductivity and electrostatic charging tendency - were measured on seven samples. Five coal-derived fuels and one sample derived from tar sands exhibited properties similar to jet fuels derived from petroleum and hence should not develop unusual ignition hazards in field handling. A JP-5 produced from shale had higher values of conductivity and charging tendency than petroleum-derived fuels, but the combination of the two properties indicates that no abnormal electrostatic hazards should be encountered. Author (GRA)

N77-12233# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CATALYTIC DEOXYGENATION OF AQUEOUS SOLUTION BY HYDRAZINE Final Report, Dec. 1974 - Jan. 1976
Peter A. Lurker May 1976 25 p refs
(AF Proj. 6302)
(AD-A025794; AMRL-TR-76-23) Avail: NTIS HC A02/MF A01 CSCL 13/2

The catalytic effects of metallic ions at their reported maximum environmental water concentrations were studied in the deoxygenation by hydrazine in aqueous solutions. Fe(III), Fe(II), Zn(II), Co(II), and Ni(II) ions did not significantly enhance the deoxygenation of aqueous solutions. The thermal effects of the kinetic deoxygenation rate for hydrazine MMH, and UDMH by the catalytic reactions with copper were studied. Previous work at this Lab established a predictive model for the deoxygenation kinetic rate constant as a function of propellant and copper concentration. This was expanded to include a thermal ratio parameter. GRA

N77-12234# Frankford Arsenal, Philadelphia, Pa.
ANALYSIS AND CHARACTERIZATION OF HIGH PURITY TALC FOR USE IN PROPELLANTS; DETERMINATION OF TALC IN PROPELLANTS
George Norwitz and Herman Gordon Dec. 1975 23 p refs
(AD-A025122; FA-TT-75082) Avail: NTIS HC A02/MF A01 CSCL 19/1

Methods are described for the analysis and characterization of high-purity talc for use in nitrocellulose-base propellants. Procedures are described for silica, magnesium oxide, R2O3, ferric oxide, aluminum oxide, calcium oxide, zinc, sulfate, phosphorus pentoxide, carbon dioxide, moisture, loss on ignition, water-soluble matter, acid-soluble matter, sieve analysis, average particle size, apparent density, and pH. Three methods are described for the determination of talc in nitro-cellulose-base propellants. The first method (which is the method recommended for the usual nitrocellulose-base propellants) is based on the silica content of the propellant, while the second method is based on the magnesium oxide content. In the third method, the talc is weighed as such, after dissolution of the propellant in morpholine, filtration, washing of the residue with water and dilute hydrochloric acid, and ignition to eliminate the graphite. GRA

N77-12235# Army Missile Command, Redstone Arsenal, Ala.
SOLID PROPELLANTS FOR HYDROGEN GAS GENERATORS
Orval E. Ayers, James A. Murfree, Pasquale Martignoni, and William M. Chew 1976 12 p

(AD-A025974) Avail: NTIS HC A04/MF A01 CSCL 20/5

Solid propellants have been developed and evaluated in a hydrogen gas generator as potential sources of hydrogen for the HF/DF chemical laser. Formulations based on the reaction of NaBH4 with Fe2O3 to produce high purity hydrogen and the reaction of NaBH4 with (NH4)2SO4 to produce a mixture of hydrogen and nitrogen have been investigated. When deuterated compounds are used in place of the hydrogen-containing compounds, deuterium (D2) is generated in place of hydrogen (H2). Propellant grains of NaBH4/Fe2O3 weighing approximately 0.08 kg have been prepared and used to generate high purity hydrogen gas for use as a laser cavity fuel and precombustor fuel in a small HF/DF chemical laser device. The propellant formulations that contain NaBH4 are very stable to moisture, exhibit no sensitivity to impact or friction, and have autoignition temperatures above 773 K. These propellants or similar type solid propellants are potential storage H2/D2 gas sources that combine instant readiness with excellent handling characteristics and compact storage. The volumetric efficiency of these solid propellants is equivalent to or greater than that of liquid hydrogen as a source of gaseous hydrogen. Experimental data from the HF/DF chemical laser tests confirm that hydrogen produced from a solid propellant grain is equivalent to commercial hydrogen for use as a cavity or precombustor fuel in the HF/DF chemical laser. Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N77-12236*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SPUTTERING

T. Spalvins 1976 13 p refs Presented at the 25th Symp. of the Mech. Failures Prevent. Group, Gaithersburg, Md., 3-5 Nov. 1976; sponsored by NBS

(NASA-TM-X-73527; E-8944) Avail: NTIS HC A02/MF A01 CSCL 13H

The potential of using the sputtering process as a deposition technique is reviewed; however, the manufacturing and sputter etching aspects are also discussed. The basic mechanism for dc and rf sputtering is described. Sputter deposition is presented in terms of the unique advantageous features it offers such as versatility, momentum transfer, stoichiometry, sputter etching, target geometry (coating and complex surfaces), precise controls, flexibility, ecology, and sputtering rates. Sputtered film characteristics, such as strong adherence and coherence and film morphology, are briefly evaluated in terms of varying the sputtering parameters. Also discussed are some of the specific industrial areas which are turning to sputter deposition techniques. Author

N77-12237# ARO, Inc., Arnold Air Force Station, Tenn.

DFVLR/AEDC COOPERATIVE THERMAL VACUUM TEST 3 Final Report, 10 Feb. - 30 Jun. 1975

W. M. Warmbrod and J. A. Roux AEDC May 1976 75 p refs

(ARO Proj. V32S-69A; ARO Proj. V41R-01A)

(AD-A024778; ARO-VKF-TR-75-106; AEDC-TR-76-29) Avail: NTIS HC A04/MF A01 CSCL 14/2

A 40-cm-diam sphere and a 30- by 30-cm flat plate, which was used to simulate a hot spot, were tested in the AEDC Aerospace Chamber (12V). This test was part of a cooperative thermal vacuum test program between AEDC and DFVLR in Porz-Wahn, West Germany. The test was conducted in four phases. Phase 1 was conducted with the solar simulator (radiant flux of one solar constant) and employed both the filtered (spectrally) and unfiltered modes; the flat plate temperature was fixed at -190, 21, and 125C. In Phase 2 the solar simulator was turned off and the temperature about the test sphere was measured for flat plate temperatures of -190, 21, and 125C. For Phase 3 the solar simulator was again turned off and small strip heaters were attached to the interior of the hollow test sphere. The heaters were used to simulate hot spots on the sphere, with the heaters set to produce 0.10, 0.25, 0.50, 0.75, and 1.00 watts of heat. The results of this test were compared with some of the results obtained on the same sphere when tested by DFVLR in Porz-Wahn. For Phase 4 the infrared (IR) scanning camera was employed to remotely map the temperature of the sphere. The thermocouple results are compared with the IR camera temperature measurements. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N77-12238 Lamar Univ. Beaumont, Tex.

EVALUATION OF SELECTED SPACE SHUTTLE ORBITER ANTENNA SYSTEMS Ph.D. Thesis

Jefferson Franklin Lindsey, III 1976 208 p

Avail: Univ. Microfilms Order No. 76-22316

The problem of computer control of the orbiter S-band quad antenna switch is analyzed with a specially developed ground based FORTRAN computer program. This program is used to simulate orbital flight and calculate look angles from the space shuttle orbiter to the appropriate tracking and data relay satellite. A theory is presented to determine the effects of the multiple dielectric thermal protection system on the S-band quad antennas. A new ray optics approach is developed which includes internal reflections from orbiter metallic skin and multiple dielectric layers. A study is made to evaluate the location of the C-band beacon antennas on the shuttle orbiter. The beacon will be used during approach and landing tests. The results show that the planned lower left and upper right antennas will provide adequate tracking information during the approach and landing tests. Dissert. Abstr.

N77-12239* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DIFFERENTIAL PULSE CODE MODULATION Patent

Calvin F. Herman, inventor (to NASA) Issued 26 Oct. 1976 9 p Filed 29 Jan. 1975 Supersedes N75-19480 (13 - 11, p 1231)

(NASA-Case-MSC-12506-1; US-Patent-3,988,729; US-Patent-Appl-SN-545283; US-Patent-Class-340-347DD) Avail: US Patent Office CSCL 17B

A differential pulse code modulation (DPCM) encoding and decoding method is described along with an apparatus which is capable of transmission with minimum bandwidth. The apparatus is not affected by data transition density, requires no direct current (DC) response of the transmission link, and suffers from minimal ambiguity in resolution of the digital data.

Official Gazette of the U.S. Patent Office

N77-12240* National Aeronautics and Space Administration. Pasadena Office, Calif.

SPACE COMMUNICATION SYSTEM FOR COMPRESSED DATA WITH A CONCATENATED REED-SOLOMON-VITERBI CODING CHANNEL Patent

Robert F. Rice (JPL) and Edward E. Hilbert, inventors (to NASA) (JPL) Issued 26 Oct. 1976 15 p Filed 23 Jun. 1975 Supersedes N75-26207 (13 - 17, p 2100) Sponsored by NASA

(NASA-Case-NPO-13545-1; NASA-Case-NPO-13543-1; US-Patent-3,988,677; US-Patent-Appl-SN-589173; US-Patent-Class-325-41; US-Patent-Class-340-146.1AL; US-Patent-Class-340-146.1AQ; US-Patent-Class-340-146.1AV) Avail: US Patent Office CSCL 17B

A space communication system incorporating a concatenated Reed Solomon Viterbi coding channel is discussed for transmitting compressed and uncompressed data from a spacecraft to a data processing center on Earth. Imaging (and other) data are first compressed into source blocks which are then coded by a Reed Solomon coder and interleaver, followed by a convolutional encoder. The received data is first decoded by a Viterbi decoder, followed by a Reed Solomon decoder and deinterleaver. The output of the latter is then decompressed, based on the compression criteria used in compressing the data in the spacecraft. The decompressed data is processed to reconstruct

an approximation of the original data-producing condition or images. Official Gazette of the U.S. Patent Office

N77-12241 Harvard Univ., Cambridge, Mass.
MICROWAVE PULSE SEQUENCE METHODS FOR THE STUDY OF ROTATIONAL RELAXATION PROCESSES Ph.D. Thesis
Stephen Lawrence Coy 1976 390 p
Avail: Univ. Microfilms Order No. 76-16802

Microwave pulse sequence methods were developed into a tool for accurate measurement of rotational relaxation times at low pressures. Basic models of the collisional coupling of the rotational energy manifold are discussed and the experimental non-idealities explored. Photon echos are observed and discussed. T sub 1 and T sub 2 for the OCS J=01 delta M=0 microwave transition are measured and the evidence found for a non-exponential T sub 1 decay is presented. The measured values are: for radiation from a coherently excited sample, 1/T sub 2 = 37.66 + or - .10 micro-second Torr, and for the population difference between the J=0, M=0, and J=1, M=0, states, 1/T sub 1 = 38.10 + or - 18/micro-second Torr. The construction and optimization of a computer-controlled spectrometer for time resolved microwave measurements are described. Dissert. Abstr.

N77-12242# Lockheed Missiles and Space Co., Palo Alto, Calif.
METHOD OF COMPUTING THE INFLUENCE OF SPHERICALLY LAMINAR INHOMOGENEITIES ON TROPOSPHERIC REFRACTION AND CONTRIBUTION TO THE RADIO REFRACTION OF MISTS, CLOUDINESS AND RAIN
S. A. Zhevakin and Kanevskii 1976 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (USSR), v. 17, no. 4, 1976 p 514-519
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Illinois 60616

A simple method is proposed for the computation of the influence of spherically-laminar inhomogeneities on tropospheric refraction by using variational derivatives of the refraction integral with respect to n and dn/dh. Underlying the method is the weak dependence of these derivatives on the model taken for the mean profile of the variation in the troposphere coefficient of refraction n with altitude h, depending on the seasonal changes in the model. The method is illustrated by its application to a computation of the contribution of mists, cloudiness, and rain to radio refractions. Author

N77-12243*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
AGRICULTURAL AND HYDROLOGICAL APPLICATIONS OF RADAR Final Report
Fawwaz T. Ulaby 31 Jul. 1976 90 p refs
(Contract NAS9-10261)
(NASA-CR-151107; RSL-TR-177-62) Avail: NTIS HC A05/MF A01 CSCL 08H

Program objectives, covering a wide range of disciplines and activities in radar remote sensing, include radar systems development and analysis, data processing and display, and data interpretation in geology, geography and oceanography. Research was focused on the evaluation of radar remote sensing applications in hydrology and agriculture based on data acquired with the Microwave Active Spectrometer (MAS) system. The title, author(s) and abstract of each of the 62 technical reports generated under this contract are appended. Author

N77-12244*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DSN Systems Engineering Office.
FINAL ENGINEERING REPORT FOR GOLDSTONE OPERATIONS SUPPORT RADAR
R. Z. Toukdarian 1 Nov. 1976 156 p
(Contract NAS7-100)
(NASA-CR-149239; JPL-TM-33-800) Avail: NTIS HC A08/MF A01 CSCL 17I

The implementation, testing, demonstration, operation, maintenance and evaluation of the equipment are discussed. Author

N77-12245# Rockwell International Corp., Anaheim, Calif. Marine Systems Div.
MULTIPLEXING TECHNIQUES FOR ADVANCED SURFACE CRAFT
Emery L. Moore and Norbert T. Bold 1 Sep. 1976 6 p refs Presented at AIAA/SNAME 3d Advanced Marine Vehicle Conf., Arlington, Va., 20-22 Sep. 1976
(X76-979/301) Avail: NTIS HC A02/MF A01

The Shipboard Data Multiplex System (SDMS) is a general purpose, asynchronous data communications system having distributed redundancy and self-auditing features. It is designed to handle the data transfer requirements of practically all shipboard subsystems; e.g., weapon direction systems, command and control consoles, displays, damage control central, navigation, interior communications, and machinery control functions. Author

N77-12246# Rockwell International Corp., Anaheim, Calif. Autonetics Group.
SHIPBOARD DATA MULTIPLEX SYSTEM (SDMS). A NEW DESIGN FOR LOWER SHIP COST AND IMPROVED FLEXIBILITY
Norbet T. Bold, Martin Wapner, and Luther M. Blackwell 1 Oct. 1976 13 p refs Repr. from Naval Eng. J., Apr. 1976 p 245-256
(X75-1095/301) Avail: NTIS HC A02/MF A01

The Shipboard Data Multiplex System (SDMS) is a general purpose information transfer system directed toward fulfilling the internal data intercommunication requirements of a variety of naval combatant ships and submarines in the 1980 time frame. Instead of the miles of unique cabling that must be specifically designed for each ship, SDMS will meet information transfer needs with general-purpose multiplex cable that will be installed according to a standard plan that does not vary with changes to the ship's electronics suite. With standard multiplex cabling throughout the ship and standard SDMS interfaces to ship subsystems, adding new equipment will be almost as simple as plugging a TV into standard house wiring outlets. However, the greatest impact of SDMS will be the decoupling of ship subsystems from each other and from the ship. Standard multiplex interfaces will avoid the cost and delay of modifying subsystems to make them compatible. The ability to wire a new ship according to a standard multiplex cable plan, long before the ship subsystems are fully defined, frees both the ship and the subsystems to develop at their own pace, will allow compression of the development schedules and provide ships with more advanced subsystems. Author

N77-12247*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SYSTEMS AND METHODS FOR DETERMINING RADIO FREQUENCY INTERFERENCE Patent Application
Klaus Johannsen (Hughes Aircraft Co., Los Angeles), Samuel Sabaroff (Hughes Aircraft Co., Los Angeles), and Varice F. Henry, inventors (to NASA) Filed 28 Oct. 1976 52 p
(NASA-Case-GSC-12150-1; US-Patent-Appl-SN-736286) Avail: NTIS HC A04/MF A01 CSCL 17B

The presence, frequency and amplitude of radio frequency interference superimposed on communication links originating from a terrestrial region and including a relay in a geostationary spacecraft are determined by pointing a narrow beam antenna on the satellite at the terrestrial region. The level of noise radiated from the region, in a predetermined frequency band of interest, to the antenna is measured at a terrestrial station that is usually remote from the region. Calibrating radio signals having a plurality of predetermined EIRP's and frequencies in the spectrum are transmitted from the region through the spacecraft narrow beam antenna back to the station where the levels of the received calibrating signals are separately measured for each of the frequency bands and EIRP's and compared to determine interference originating from the region. NASA

N77-12248*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RECEIVING AND TRACKING PHASE MODULATED SIGNALS Patent Application
Salvador Villarreal, Stuart Donald Lenett, and Herbert S. Kobayashi, inventors (to NASA) Filed 2 Nov. 1976 14 p
(NASA-Case-MSC-16170-1; US-Patent-Appl-SN-737975) Avail: NTIS HC A02/MF A01 CSCL 17B

A receiver is described for tracking and demodulating several types of phase modulated communications, either analog

or digital data, for either residual carrier or suppressed carrier signal and for phase modulation or keying of two, four or higher phase angles, from 0 deg through 360 deg. A carrier component signal and a converted series sideband component signal are obtained from the incoming signal and summed to produce a carrier tracking signal, permitting more accurate tracking of the above types of phase modulated data. NASA

N77-12249# Signals Research and Development Establishment, Christchurch (England).
A BINARY TO GRAY CODE CONVERTER FOR INCORPORATION IN A DATA MODEM
F. W. Abbatt and C. E. G. Sims Jan. 1976 18 p refs
(SRDE-76002; BR52595) Avail: NTIS HC A02/MF A01

The design and testing of a binary to Gray code converter for use with a data modem are dealt with. The results of measurements carried out using this converter show how a reduction of error rate for a given S/N ratio is obtained when using this technique. Author (ESA)

N77-12250# Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
NUMERICAL INVESTIGATIONS OF MONOPOLE ANTENNA SYSTEMS ON CONDUCTING CYLINDERS
Jesper Hansen and Ole Rydahl Aug. 1976 119 p refs
(Contract ESTEC-2290/74-HP)
(R-166; ESA-CR(P)-850) Avail: NTIS HC A06/MF A01

Investigations are described of the properties of omnidirectional antenna systems (turnstile antennas and their derivations) mounted on perfectly conducting cylinders of dimensions comparable to the wavelength. The investigations are made by numerical methods using magnetic and electric field integral equations solved by the method of moments. Parametric curves of isotropy as well as radiation patterns for representative cases are presented. Author (ESA)

N77-12251# M-O Valve Co. Ltd., Hammersmith (England).
A FOLLOW-ON STUDY ON CROSSED-FIELD AMPLIFIERS FOR TVBS MISSION Final Report
A. Reddish and M. A. Hulley Oct. 1975 52 p refs
(Contract ESRO-SC/29-HQ)
(HR1084; ESA-CR(P)-851) Avail: NTIS HC A04/MF A01

The possibility of using a crossed field amplifier for the output tube of a television broadcasting satellite was investigated. The work reported covers: the modification and hot testing of existing folded waveguide circuit amplifiers; testing the effect of changes by supporting studies on stray RF effects and their reduction and on electron gun design; and the design, construction, and hot testing of a prototype new vane-heli circuit amplifier to test the idea that a higher impedance will provide better efficiency. In order to use existing components and test equipment, this was to remain at low X-band in the original tube envelope rather than changing immediately to 12 GHz and the space tube configuration ultimately required. ESA

N77-12252# Rome Air Development Center, Griffiss AFB, N.Y.
TIME DOMAIN RADIATION FIELDS OF A MONOPOLE ANTENNA Final Report
John A. Potenza May 1976 42 p refs
(AF Proj. 4506)
(AD-A025619; RADC-TR-76-53) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report establishes the utility of direct time domain computer solutions to analyze and predict transient radiation from wire antennas. The radiation fields from a monopole antenna excited by a short video pulse have been computed for several elevation aspect angles and critically compared to previously published CW results. Time domain performance parameters have been defined and used to describe the 'goodness' of short pulse antenna performance. A physical interpretation of the radiation mechanism associated with short pulse excited monopoles was reviewed to provide the radar with the basic underlying principles of short pulse radiation and an understanding of time domain radiated fields. Author (GRA)

N77-12253# University Coll., London (England). Dept. of Statistics and Computer Science.
UNIVERSITY COLLEGE LONDON ARPANET PROJECT Annual Report, 1 Oct. 1974 - 31 Dec. 1975
Peter T. Kirstein Feb. 1976 24 p refs
(Contract N00014-74-C-0280)
(AD-A025293; TR-27-Rev) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report summarizes the work at University College London UCL on research into, and use of, the ARPA Computer Network. It discusses activities on connecting hosts and other networks to ARPANET. It discusses early work on a Packet Satellite Project, and measurements at at a high level of the characteristics of usage via UCL of network hosts. It describes the applications which have benefited from ARPANET during the reporting period. Finally, it discusses an investigation of the techniques for facsimile transmission between different devices over the network. Earlier work in attacking hosts by front-end techniques has been broadened to provide gateway facilities between computer networks. Here, pursued were two lines. An internetwork Transmission Control Protocol TCP has been implemented which is designed to be applicable to a host-host protocol between hosts on different networks. Experiments to test the properties of this protocol have been started between UCL, Stanford U and Bolt, Beranek and Newman BBN. More effort has been put into designing and implementing gateway functions when a specific node acts as a gateway between two networks and performs a mapping between the standard protocols of each. Investigated was the applicability of this approach to several networks, including the connection oa ARPANET and the UK Post Office Experimental Packet Switched Service EPSS. Preliminary results show that the technique should be feasible, but since the other networks are not yet operational, the technique was not demonstrated. GRA

N77-12254# Stanford Univ., Calif. Electronics Labs.
INTERPROCESS COMMUNICATION PROTOCOLS FOR COMPUTER NETWORKS
Carl Allan Sunshine Dec. 1975 278 p refs Sponsored in part by NSF
(Contract MDA903-76-C-0093; ARPA Order 2494)
(AD-A025508; TR-105) Avail: NTIS HC A13/MF A01 CSCL 17/2

This thesis focuses on the design and analysis of interprocess communication protocols for networks of computers. Previous research has emphasized system performance at lower levels, within the communication medium itself. This work examines requirements and performance of protocols for communication between processes in the Host computers attached to the communication system. Both the reliability and the efficiency of protocols are discussed. Reliability involves overcoming unreliable network transmission facilities to avoid loss, duplication, or out-of-order delivery of data. Reliability performance goals are defined, and the correctness of different protocol mechanisms in achieving these goals is demonstrated. Consequences of protocol failures (Host crashes) and problems of initializing control mechanisms required for reliable communication are also considered. GRA

N77-12255# Office of Naval Research, London (England).
COLLOQUIUM ON SOLID STATE TRANSMITTERS FOR RADAR
David A. Hart 30 Apr. 1976 8 p Presented at London, 9 Jan. 1976
(AD-A025189; ONRL-C-11-76) Avail: NTIS HC A02/MF A01 CSCL 17/9

The institution of Electrical Engineers' Colloquium on Solid-State Transmitters for Radar was held in London on 9 January 1976. The 10 papers presented discussed various components and devices such as GaAs transferred electron oscillator, IMPATT and TRAPATT device for generating microwave power for radar applications. Also discussed were radar systems employing solid-state devices, e.g., radar altimeters, Doppler radars and battlefield surveillance radars. A brief discussion of each paper is presented. Author (GRA)

N77-12256# Naval Surface Weapons Center, White Oak, Md.
A PRELIMINARY REPORT ON THE IN-HOUSE EXPLORATORY DEVELOPMENT PROGRAM ON MICROSTRIP PATCH ANTENNAS AT THE NAVAL SURFACE WEAPONS CENTER

L. M. Black and J. W. McCorkle Dec. 1975 27 p
(AD-A025304; NSWC/WOL/TR-75-200) Avail: NTIS HC A03/MF A01 CSCL 09/5

A discussion of the goals of the program is followed by some brief background notes on the study itself. The design parameters are then presented for determining the dimensions of the antenna and the input impedance. The report concludes with a discussion of work in progress. Author (GRA)

N77-12257# Intelcom Rad Tech, San Diego, Calif.
STUDY OF THE EFFECTS OF RADIATION ON THE ELECTRICAL AND OPTICAL PROPERTIES OF HgCdTe
Charles E. Mallon, Roland E. Leadon, and James A. Naber 20 Jan. 1976 61 p refs
(Contract F19628-75-C-0170; DNA Proj. NWED-QAXTA026)
(AD-A025222; RT-8137-003; AFCRL-TR-76-0053; SR-1) Avail: NTIS HC A04/MF A01 CSCL 17/5

This report presents the results of an experimental and theoretical investigation of the effects of radiation on the optical and electrical properties of the alloy semiconductor HgCdTe. The objective is to obtain sufficient radiation effects data to enable reliable prediction of the radiation response of detectors fabricated from HgCdTe. The previous studies used n-type Hg(0.8)Cd(0.2)Te with extrinsic electron densities on the order of 1.5 x 10 to the 15th power/cc. The present studies differ in that lower-carrier-density material (n-5 x 10 to the 14th power/cc), which is more representative of current state-of-the-art detector-grade material, is being studied. An effort is made to describe the experimental procedures and conditions in sufficient detail to allow comparison and correlation of this data with that of other investigations. GRA

N77-12258# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
THE MAXIMUM LIKLIHOOD METHOD APPLICATIONS TO DAASM STUDIES Final Report, 1 Nov. 1971 - 30 Jun. 1975
Rajan Varad and William C. McComish 30 Jun. 1975 62 p refs
(Contract F19628-72-C-0089; AF Proj. 7663)
(AD-A025223; BC-SDAL-76-01; AFCRL-TR-75-0551) Avail: NTIS HC A04/MF A01 CSCL 20/14

The MLM has been applied to simulated models of signals and noise to ascertain Doppler and angular information. The models closely correspond to HF signals propagating through the ionosphere. Relevant mathematical derivations and properties are presented. Examples of the technique as applied to actual data are also presented. GRA

N77-12259# AEL Service Corp., Farmingdale, N.J.
ELECTROMAGNETIC RADIATION SYSTEM (EMRS) FOR SUSCEPTIBILITY TESTING Quarterly Report, 3 Nov. 1975 - 30 Jan. 1976
Edwin S. Iskra Apr. 1976 27 p refs
(Contract DAAB07-76-C-0332; DA Proj. 1S7-62701-AH-92)
(AD-A025243; AELSC-TR-23-1; ECOM-76-0332-1) Avail: NTIS HC A03/MF A01 CSCL 20/14

The function of the Electromagnetic Radiation System (EMRS) is to generate electromagnetic energy so as to produce a constant field strength that can be automatically scanned as a function of frequency. The design objective is to cover the frequency range of 30 hertz to 40 gigahertz with field strength intensities up to 200 volts per meter. An analysis of military standards, in which similar fields are used to evaluate the electromagnetic susceptibility of military equipment, indicates that present equipment configurations are unsuitable for this application due to limitations of their characteristics and lack of programming capability. An analysis of commercially available equipment indicates that adequate electronics are available for EMRS use except in the area of 18 gigahertz to 40 gigahertz. A parallel plate line is proposed to be used as the field generating device for the lower frequencies. At the higher frequencies, reflector type antennas are proposed. Author (GRA)

N77-12260# Stanford Univ., Calif. Digital Systems Lab.
ARPA INTERNETWORK PROTOCOLS PROJECT Status Report, 15 Nov. 1975 - 15 Feb. 1976
Vinton G. Cerf 15 Feb. 1976 57 p refs
(Contract MDA903-76-C-0093; ARPA Order 2494)
(AD-A024823; SU-TN-83) Avail: NTIS HC A04/MF A01 CSCL 17/2

This quarterly report summarizes changes in the TCP specification, measurement of VDH overhead, plans for the single connection TCP/TELNET, and mentions the development of a very small LSI-11 interface to the BBN IMP. Author (GRA)

N77-12261# Stanford Univ., Calif. Digital Systems Lab.
ARPA INTERNETWORK PROTOCOLS PROJECT Status Report
Vinton G. Cerf 15 Nov. 1975 29 p
(Contract MDA903-76-C-0093; ARPA Order 2494)
(AD-A024819; SU-TN-68) Avail: NTIS HC A03/MF A01 CSCL 17/2

An Internetwork Communication Protocol was implemented which permits reliable interprocess communication to be established between hosts in different networks. Estimates of program size are made for a single connection version of the program for use in a mobile packet radio terminal. Preliminary throughput measurements indicate serious problems with the Very Distant Host interface and its related software. A plan for detailed analysis of delays in the system has been made and the results will be reported during the next quarter. GRA

N77-12262# Stanford Univ., Calif. Digital Systems Lab.
TCP RESYNCHRONIZATION
Vinton G. Cerf 11 Jan. 1976 16 p refs
(Contract MDA903-76-C-0093; ARPA Order 2494)
(AD-A024822; SU-TN-79) Avail: NTIS HC A02/MF A01 CSCL 17/2

This note elaborates the notion of duplicate detection through sequencing and the need for resynchronizing the sequence numbers in use on a full duplex connection under certain conditions. Author (GRA)

N77-12263# Vought Corp. Advanced Technology Center, Inc., Dallas, Tex.
LINEAR NOISE-CANCELLING MICROPHONE Final Report, 20 May 1975 - 20 Apr. 1976
Austin J. Brouns Jun. 1976 34 p refs
(Contract DAAB07-75-C-0140; DA Proj. 1S7-63707-D-437)
(AD-A025903; ATC-B9410016CR-14; ECOM-75-0140-F) Avail: NTIS HC A03/MF A01 CSCL 17/2

The document covers the technical details of work performed to improve the performance of noise-cancelling microphones for military use. A major objective was to develop a wider-bandwidth, wider-dynamic-range microphone. Accomplished improvements over predecessor models include 4 dB greater noise-immunity, 12 dB less vibration sensitivity, better electrical shielding, and demonstration that the microphone will operate in extreme military environments and that the 1st order gradient microphone which consists of a ring 'BIMORPH' piezoceramic element and integral pre-amplifier can be hermetically sealed. GRA

N77-12264# Semcor, Inc., Moorestown, N.J.
A COMPARISON OF DISTRIBUTED CONTROL AND COMMAND/RESPONSE MULTIPLEX SYSTEMS
8 Jan. 1975 108 p refs
(Contract N62269-74-C-0761)
(AD-A025105; SR-JJK-75-008-1) Avail: NTIS HC A06/MF A01 CSCL 17/2

This report contains the results of a study made to compare two different multiplex philosophies for the transfer of avionics information within military aircraft. One of these philosophies, termed command/response, concerns a digital time division multiplex (TDM) technique in which the data bus is under strict, centralized control. The other philosophy, also digital TDM, is based upon distributed control of the data bus through the application of a polling/contention technique. Although the two philosophies themselves can be compared, specific system architectures must also be introduced to facilitate a more comprehensive analysis. Of the numerous system architecture, the models chosen in this report to exemplify the two multiplex philosophies are the systems described in the proposed DOD standard MIL-E-XXX and the proposed NAVAIRDEVCEN specification for a General Aircraft Multiplex System. These

systems were chosen because they essentially embody the most recent thinking of the military services in the areas of command/response and distributed multiplex systems, respectively. The systems are compared with respect to certain key items such as system architecture, method of bus access, etc. After the characteristics of each system are described with respect to each key item, the significance of the differences (and similarities) between the command/response system and GAMS is discussed. This latter discussion appears for each key item under the title of System Impact. GRA

N77-12265# Naval Postgraduate School, Monterey, Calif.
AN INTEGRATED SYSTEM APPROACH FOR AUTOMATIC SWITCHING RADIO TELEPHONY M.S. Thesis
Adhi Widjaja Natahartaka Dec. 1975 59 p refs
(AD-A024889) Avail: NTIS HC A04/MF A01 CSCL 17/2

An implementation of I.C.'s in an automatic switching radio telephony will be presented. Components were chosen to be compatible, however, in some part of the circuit where analog and digital signals are present, or signal levels and impedance of the analog signal produce incompatibility, it is understood that interface elements should be introduced. Author (GRA)

N77-12266# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
PERFORMANCE MEASUREMENTS OVER LONG LINE-OF-SIGHT MICROWAVE LINKS IN COLORADO
C. A. Samson, A. P. Barsis, and D. Smith Jun. 1976 62 p refs
(PB-256261/9; OTR-76-92) Avail: NTIS HC A04/MF A01 CSCL 17B

Performance measurements are being made at 6 and 11 GHz on two long line-of-sight microwave paths in eastern Colorado (108 and 116 km). Both long and short term variations in signal level obtained since March 1975 are compared with the predicted values, and analyzed with respect to the effects of terrain features, path clearance, refractivity gradients, precipitation, and synoptic weather patterns. Results of limited digital transmission tests made on one link are given in an appendix. GRA

N77-12267# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
SIGNAL-TO-NOISE RATIOS IN A PCM/PSK SYSTEM
Hiroshi Akima Jun. 1976 29 p refs
(PB-255939/1; OTR-76-91) Avail: NTIS HC A03/MF A01 CSCL 17B

Output signal-to-noise ratios (SNR's) in a pulse-code-modulation/phase-shift-keying (PCM/PSK) system are calculated. Two-phase, four-phase, and eight-phase PSK systems are considered. The calculated SNR at the demodulator output is expressed as a function of the intrinsic SNR (i.e., the ratio of signal power to noise power contained in the baseband bandwidth) at the demodulator input and parametric in the number of quantizing levels in PCM. The performance of the PCM/PSK system is compared with those of other typical systems such as single-sideband (SSB) and frequently-modulation (FM) systems. GRA

N77-12268# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
ANALYSIS OF OCCURRENCE OF SPORADIC E AND ACCURACY OF PREDICTIONS OF SPORADIC-E CRITICAL FREQUENCIES FOR TEMPERATE LATITUDE NORTHERN HEMISPHERE STATIONS
Pamela Gosnell and Margo Leftin Jun. 1976 42 p refs Sponsored in part by DOD
(PB-255875/7; OTR-76-89) Avail: NTIS HC A03/MF A01 CSCL 20N

A study was conducted to determine: percentage of time that sporadic E was observed at fifteen locations during four years (1965, 1967, 1969, and 1971), and the accuracy of sporadic-E predictions based on the ITS numerical coefficients. Results indicate that sporadic E is present almost 50% of the time during summer at mid-latitudes and at night in the high latitudes, and updated coefficients may well predict the general trend of observations more closely than the current coefficients. GRA

N77-12269# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
WORLD MAPS OF SPORADIC E (foEs GREATER THAN 7 MHz) FOR USE IN PREDICTION OF VHF OBLIQUE-INCIDENCE PROPAGATION Special Publication
Ernest K. Smith Jun. 1976 66 p refs
(PB-255904/5; OT-SP-76-10) Avail: NTIS HC A04/MF A01 CSCL 17B

The report presents three world-wide maps of sporadic E (foEs > 7 MHz) derived from published vertical-incidence maps supplemented by new ionosonde data. GRA

N77-12270# National Oceanic and Atmospheric Administration, Boulder, Colo. Aeronomy Lab.
A VHF TRANSMITTER AND SYSTEM SYNCHRONIZER FOR USE IN A PORTABLE DOPPLER RADAR SYSTEM
Paul E. Johnston, Warner L. Ecklund, and Raymond A. Greenwald Feb. 1976 38 p refs
(PB-256094/4; NOAA-TR-ERL-358; AL-11; NOAA-76051302) Avail: NTIS HC A03/MF A01 CSCL 17I

A portable 50 MHz transmitter capable of 15 kW peak rf power output at up to 5 percent duty cycles is described. The transmitter and a system synchronizer, also described, are combined with a frequency-coherent receiver, an on-line minicomputer processor with oscillographic display, and a novel collinear antenna to provide a highly portable VHF Doppler radar system. The system, complete with 5-degree azimuthal beamwidth antenna, weighs about 250 kg, and can be installed in remote locations in a few days. It has been used successfully in studies of equatorial and auroral ionospheric irregularities during the past several years. GRA

N77-12271# Massachusetts Inst. of Tech., Cambridge.
LOW COST DATA AND TEXT COMMUNICATION FOR THE LESS DEVELOPED COUNTRIES: A STUDY WITH SPECIAL REFERENCE TO THE NEEDS OF THE INTERNATIONAL AGRICULTURAL RESEARCH CENTERS
Ithiel DeSola Pool, Elliot Freedman, and Colin Warren Jan. 1976 150 p
(PB-256067/0) Avail: NTIS HC A07/MF A01 CSCL 17B

High technology systems of data communication including facsimile, computer polling systems, packet switching, and multiple access satellite systems are manageable in, and appropriate to the needs of the less developed countries. Use of such technologies can (1) markedly reduce costs for some important services; (2) locate activities in those centers where adequate maintenance and technical personnel exists; and (3) give the LDC's access to the best and most advanced technical information bases. GRA

N77-12272# Harris Corp., Melbourne, Fla. Electronic Systems Div.
MULTIPLE TARGET INSTRUMENTATION RADAR (MTIR) STUDY, PHASE 2, ADD-ON Final Report, 16 Mar. - 30 Nov. 1975
E. J. Claire Nov. 1975 25 p refs
(Contract N00014-75-C-0033)
(AD-A025939) Avail: NTIS HC A02/MF A01 CSCL 17/9

This report summarizes the activities of Harris Electronic Systems Division on the design of a new Multiple Target Instrumentation Radar and provides the final results of the Phase II Add-on Modification P00001 to Contract No. N00014-75-C-0033. The objective of the present study was to perform a source selection analysis to determine the best computer choice for the MTIR, to deliver the recommended computer to NRL, and to demonstrate performance of the MTIR system simulation software package developed by Harris ESD under the Phase II Contract. The preceding objectives were successfully accomplished. Author (GRA)

N77-12273# DOD Aircraft Ground Fire Suppression and Rescue Office, Wright-Patterson AFB, Ohio.
EVALUATION OF RADIO COMMUNICATIONS FOR USE BY INDIVIDUAL FIRE FIGHTERS Final Report, Jun. 1973 - Aug. 1975
William G. Bennett Mar. 1976 78 p refs
(AD-A025936; DOD-AGFSRS-76-5) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report presents the results of a project undertaken to fulfill an operational requirement for an individual, two-way communications system for fire-fighters. Contracts were initiated in June 1973 to obtain the basic radios and several accessories to be used in an operational test and evaluation program. The items purchased were selected because they were both commercially available, i.e., no development effort required, and because they appeared to offer the greatest potential for satisfying the stated needs of the operational commands. GRA

N77-12274# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.

A COMPUTER PROGRAM FOR RADIATION FROM ARBITRARILY ORIENTED WIRE ANTENNAS OVER IMPERFECT GROUND

Tapan K. Sarkar and Bradley J. Strait May 1976 36 p refs (Contract F19628-73-C-0047; AF Proj. 5635)
(AD-A025457; RADC-TR-76-136; SR-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report describes and lists a computer program for analyzing radiation from antenna arrays of arbitrarily oriented thin-wire antennas over the plane surface of an imperfectly conducting earth. The solution is that obtained from the E-field integral equation by the method of moments. The program input is the problem geometry, the array excitation and loading, and the characteristics of the earth. The program output is the current distribution on the wires, input independences of the feed points, and the complex E-field at points in space specified by the users. Sample input-output data are included. Author (GRA)

N77-12275# Naval Postgraduate School, Monterey, Calif.

A SECURE VOICE SYSTEM WITH BANDWIDTH REDUCTION M.S. Thesis

Fidel L. Baca Mar. 1976 42 p refs
(AD-A025433) Avail: NTIS HC A03/MF A01 CSCL 17/2

The need for secure voice communication systems is increasing both in the civil and military arenas. Coupled with this is the need for conserving bandwidth, increasing performance, and reducing costs. Currently used secure voice methods are relatively antiquated and do not provide desired performance and bandwidth conservation without incurring increasing costs. A new system, proposed herein offers bandwidth reduction, increased performance, and decreasing costs while using modern digital techniques as opposed to analog techniques. The proposed system, known as VOCOM, operates in existing voice bandwidths using existing equipment, and offers a higher level of privacy and security while at the same time simplifying software handling. Additionally, the proposed system offers the user real-time operation to enhance critical decision-making. Author (GRA)

N77-12276# Harry Diamond Labs., Adelphi, Md.

NUCLEAR ELECTROMAGNETIC PULSE SIMULATION BY POINT SOURCE INJECTION TECHNIQUES FOR SHIELDED PENETRATIONS

Robert F. Gray Dec. 1975 49 p refs
(AD-A024803; HDL-TR-1737) Avail: NTIS HC A03/MF A01 CSCL 18/3

Nuclear electromagnetic pulse simulation by point source injection techniques was investigated for shielded and unshielded system penetrations. Circuit theory is applied to the unshielded case, and a generalized injection system is suggested. To determine the relationship between point source current injection on the external shield of a cable and its response to free-field EMP excitation, general transmission line solutions were obtained in the frequency domain for each case. A numerical transform was used to obtain time domain waveforms of the external and internal currents. Both solutions were verified with experimental data collected on a braided shield coaxial cable that exhibited both types of reactive coupling (inductive and capacitive) through its shield. Shielding effectiveness transfer functions were experimentally obtained with a coaxial cable drive, to determine the shield parameters. GRA

N77-12277# Naval Postgraduate School, Monterey, Calif.

THE HORIZONTALLY POLARIZED DIPOLE ANTENNA AS A SOLUTION TO THE PROBLEMS OF HIGH FREQUENCY SHORT RANGE COMMUNICATIONS

Robert Allison Hopper Mar. 1976 108 p refs
(AD-A025674) Avail: NTIS HC A06/MF A01 CSCL 09/5

The purpose of this paper is to examine the problem of short range communications, in particular, communications within the area of the high frequency band commonly known as the skip zone or silent area and to determine the feasibility and extent to which a horizontally polarized antenna could be used to alleviate these problems. A documentation of the problems of short range communications as they affect U. S. Naval operations will be made, including ship to shore, shore to ship, and ship to ship communications. Current methods of communicating within this region will be examined, and a study of the cost effectiveness of the solution will be made to determine if the solution is in fact worth the investment. Author (GRA)

N77-12278# Naval Research Lab., Washington, D.C.

PERFORMANCE OF A RANGE-AMBIGUOUS MTI AND DOPPLER FILTER SYSTEM Interim Report

J. K. Hsiao 24 May 1976 20 p refs
(NRL Proj. R02-86; RF12151403)
(AD-A025683; NRL-7687) Avail: NTIS HC A02/MF A01 CSCL 17/9

In this report the clutter-rejection performance of a range-ambiguous MTI and doppler-filter system is analyzed. The reduction of correlation time in a range-ambiguous system in general improves the clutter-rejection performance. However, due to the fold over phenomenon, a faraway target has to compete with the near-in clutter; hence a higher improvement factor is required. Examples presented here which take into account these effects show that the improvement factor of a range-ambiguous MTI system is slightly better than that of a range-unambiguous system. However, the performance of a Doppler-filter processor in a range-ambiguous system is worse. Author (GRA)

N77-12279# Cincinnati Electronics Corp., Ohio.

EQUIPMENT COMPLIANCE REPORT FOR AN/URC-78(XE-1)/V. VOLUME 4: SERVICE CONDITION TEST REPORT

15 Dec. 1974 256 p
(Contract DAAB07-71-C-0183)
(AD-A025667) Avail: NTIS HC A12/MF A01 CSCL 17/2

The report contains the results of the service condition (environmental) tests. These tests were performed according to the procedures outlined in the Advanced Development Model Compliance Test Plan. The applicable parts of the test plan which pertain to the service condition tests are included. GRA

N77-12280# Rockwell International Corp., Anaheim, Calif. Electronics Group.

COHERENT OPTICAL ADAPTIVE TECHNIQUES (COAT) Final Technical Report

C. L. Hayes, R. A. Brandewie, W. C. Davis, G. E. Mevers, and J. SooHoo Feb. 1973 124 p refs
(Contract F30602-72-C-0417; ARPA Order 1279)
(AD-A025668; C72-731/501; RADC-TR-73-95) Avail: NTIS HC A06/MF A01 CSCL 17/5

COAT (Coherent Optical Adaptive Techniques) is the name given to an optical phased array transceiver system which automatically compensates for atmospheric distortion along the propagation path of the beam (turbulence, thermal blooming, laser amplifier). Based upon the principle of transmitting a wavefront which is the phase conjugate of the received wavefront, the COAT system can lock onto and track a target of very small dimension under conditions in which a conventional single-element system would fail or perform poorly. That is, energy can be focused at the target. A previous experiment successfully demonstrated the concept for a two-element system. This report describes the implementation and test results of a multiaperture (1x6) array operating at a wavelength of 10.6 micrometers. Temporal and spatial information from the intensity distributions developed at ranges of 1 km and 10 km are presented as an evaluation of system performance. A theoretical prediction of system operation through computer simulation has also been made and shows the system to be operating near the theoretical limit. GRA

N77-12281# Computer Sciences Corp., Falls Church, Va.

MOBILE TERMINAL ACCESS TO THE ADVANCED COMMAND-CONTROL ARCHITECTURAL TESTBED Final Report

May 1976 72 p refs
(Contract N00039-75-C-0289)
(AD-A025818) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report presents the design considerations for establishing a recommended communications test link between a Mobile Applications Terminal and the Advanced Command-Control Architectural Testbed at NELC, San Diego. The test link makes use of existing capabilities of the Naval Telecommunications System (NTS) and interfaces with ARPANET. Phase I of this effort surveyed existing Navy and ARPA communications means which could be used to establish and demonstrate the test link during FY-77/78. The communications link analysis was guided by the requirement that the Mobile Terminal and its test link accommodate, to the maximum extent, procedures and interfaces prescribed by the NTS and those of ARPANET. Based on a review of alternative link configurations, the Navy GAPFILLER UHF Satellite System was selected as the desired radio path for the test link. The FLTSATCOM UHF Satellite System, when operational, could replace the GAPFILLER satellite. Phase II of this effort has focused on the design considerations of the recommended link, including the operational, technical, and administrative details of the GAPFILLER satellite and its terminals. GRA

N77-12282# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala.
WAVE ANALYZER DYNAMIC RANGE AND BANDWIDTH REQUIREMENTS FOR SIGNAL NOISE ANALYSIS
J. R. Ashley, T. A. Barley, and G. J. Rast, Jr. 26 Mar. 1976 36 p refs
(AD-A024671; RE-76-26) Avail: NTIS HC A03/MF A01 CSCL 14/2

This paper first describes, in general terms, two techniques for measuring AM and FM noise that is close to the carrier frequency (near carrier-Doppler) of a radar or other microwave signal source. Either of these techniques produces outputs, in the frequency range from DC to a few hundred kilohertz, that must be further analyzed with an appropriate analyzer. The nature of the noise to be analyzed dictates limitations on the dynamic range and bandwidth of the instrument. These limitations are developed in this paper for the specific case described. However, this instrumentation problem and the solution described are broad enough in scope and tutorial enough in nature to be applicable to many video (audio band) noise analysis problems. A discussion of possible applications in the field of audio band signal analysis is presented. Author (GRA)

N77-12283# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
A STUDY OF NEAR-FIELD DATA HANDLING AND PROBE DESIGN TECHNIQUES Final Technical Report, 13 Jun. 1975 - 15 Apr. 1976
G. K. Huddleston, E. B. Joy, G. P. Rodrigue, C. P. Burns, and W. J. Stoey Apr. 1976 87 p refs
(Contract DAAH01-75-C-0953)
(AD-A024990; E-21-661/A-1751) Avail: NTIS HC A05/MF A01 CSCL 09/2

The ability to fully characterize a probe antenna using a near-field range is demonstrated subject to the conditions that two identical probes are available. A completely general three antenna approach, requiring no such assumptions, appears feasible. Some questions with respect to uniqueness of solution of the three antenna approach remain. Experimental results indicate that at wide angles (approx. 77 deg), considerably below the apparent geometric limit, the planar near-field approach suffers a notable loss of accuracy. Improvements in both hardware and software-techniques to increase the data handling ability of the near-field facility are described. Author (GRA)

N77-12284# Naval Research Lab., Washington, D.C.
EVALUATION OF THE RADIATION FIELD IN A SPHERICALLY SYMMETRIC PLASMA
J. P. Apruzese and J. Davis May 1976 30 p refs Sponsored by NSF
(Contract AT(04-3)-878; NRL Proj. H02-29A)
(AD-A024922; NRL-MR-3277) Avail: NTIS CSCL 20/9

Two methods are presented for calculating the radiation field in a spherically symmetric plasma. The first method involves ray tracing and the use of Feautrier's equations and allows evaluation of the zeroth and all higher moments of the radiation field. The second approach makes use of an approximate variable Eddington factor to integrate the combined moment equation of radiative transfer. GRA

N77-12285# Harry Diamond Labs., Adelphi, Md.
INCREMENTAL TECHNIQUE FOR ABSOLUTE MEASUREMENT OF COHERENT POWER AT MILLIMETER AND SUBMILLIMETER WAVELENGTHS
Abraham Singer and Jan M. Minkowski Feb. 1976 16 p refs
(AD-A025201; HDL-TR-1699) Avail: NTIS HC A02/MF A01 CSCL 14/2

A technique for making absolute measurements of coherent rf power is described. The technique surmounts the primary shortcoming of the other existing techniques in that it permits absolute measurement of power at all radio frequencies, whereas the other techniques are inherently frequency limited, with the current upper limit being about 75 GHz. This major advantage stems from the fact that the technique utilizes a direct comparison of the unknown rf power with a primary standard, whereas all other techniques require a conversion of the power to heat before making the comparison. This technique permits absolute measurement of coherent rf power above about -10 dBm, with an accuracy of several tenths of a decibel. Its major usefulness is, of course, at millimeter and submillimeter wavelengths where no other reliable method for absolute measurement of rf power currently exists. In addition, it has the important advantages of relative simplicity and reliability. Author (GRA)

N77-12286# RAND Corp., Santa Monica, Calif.
AN OVERVIEW DISCUSSION OF PROPAGATION EFFECTS OF NUCLEAR ENVIRONMENTS ON VLF-LF COMMUNICATION SYSTEMS Topical Report, 4 Sep. 1974 - 31 Aug. 1975
C. M. Crain 31 Aug. 1975 28 p
(Contract DNA001-74-C-0019; DNA Proj. NWED-QAXHE043)
(AD-A024956; DNA-3778T) Avail: NTIS HC A03/MF A01 CSCL 17/2

It is the purpose of this brief overview to bring out the general features of long wavelength propagation at VLF and LF frequencies, how nuclear environments can degrade the normal communications capability which these systems provide, and the consequences of remaining uncertainties in predicting the degree of degradation expected under worst-case conditions. Author (GRA)

N77-12287# Dikewood Industries, Inc., Albuquerque, N. Mex.
ASSEMBLING OF THE RANGE PARTIALS INTO THE RANGE WORD IN THE ACMI SYSTEM Final Report
Roger T. Stevens Apr. 1976 14 p
(Contract F29601-74-C-0022)
(AD-A024770; DC-TR-1242-17; AFSWC-TR-76-2) Avail: NTIS HC A02/MF A01 CSCL 17/9

This paper describes how the Air Combat Maneuvering Instrumentation (ACMI) range tones are digitized, corrected for calibrations and delays, and checked and combined into 21 bit range words which represent the distance from the interrogator to the transponder to each receiver. GRA

N77-12288# California Univ., Los Angeles. Dept. of System Sciences.
MOMENT SPACE ERROR BOUNDS FOR DIGITAL COMMUNICATION SYSTEMS WITH INTERSYMBOL INTERFERENCE BASED ON nth MOMENT
T. Y. Yan 2 Jan. 1976 39 p refs
(Contract N00014-75-C-0528; NR Proj. 042-285)
(AD-A025013; UCLA-ENG-7608) Avail: NTIS HC A03/MF A01 CSCL 17/2

The upper and lower bounds on the error probability arising from the degradation of intersymbol interference (ISI) and additive Gaussian noise in a baseband digital communication system are derived via the isomorphism theorem from the theory of moment space. It is assumed the ISI random variable has a finite distortion and its n(th) moment is known. It is found that the second moment case gives exactly the result that Matthews achieved and can be generalized to any higher order moments.

Bounds are extremely tight for the two channels of interest and expected to be good for all other channels. A numerical example for the fourth moment case is given. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N77-12289 Vermont Univ. and State Agricultural Coll., Burlington.
RADIOFREQUENCY STUDIES OF THE EFFECTS OF TEMPERATURE ON THE ELECTRICAL CONDUCTIVITY OF CLEAN AND CONTAMINATED DISCONTINUOUS METAL FILMS Ph.D. Thesis
John Russell Harkay 1976 267 p
Avail: Univ. Microfilms Order No. 76-22314

A computerized a.c. technique, which represents the electrical behavior of a film by an equivalent circuit composed of frequency-independent resistors and capacitors, was used to interpret measured values of the frequency dependent resistance of films of molydenum, platinum, aluminum, and copper as a function of temperature from 150 to 400 K at various stages of exposure to carbon monoxide and oxygen. The resistance of these films was measured as a function of frequency from 0.5 to 30 Mhz and analyzed to distinguish conduction within film grains from the intergranular component. Dissert. Abstr.

N77-12290 Polytechnic Inst. of New York.
MUTUAL COUPLING IN SPHERICAL ARRAYS OF CIRCULAR WAVEGUIDE ELEMENTS Ph.D. Thesis
Yuh-Lang Liu 1976 169 p
Avail: Univ. Microfilms Order No. 76-23429

Self and mutual admittances between any two arbitrarily located elements on the sphere surface were calculated in terms of modal expansions in spherical modes. The E-plane and H-plane admittance functions were formed. The admittance between two arbitrarily located and arbitrarily polarized elements can be expressed in terms of these admittance functions. The isolated element pattern of circular waveguide excited with TE sub 11 mode on the perfectly conducting sphere was also computed. The isolated element pattern for sufficiently small element size was compared with the results for a magnetic dipole on a sphere. Mutual coupling coefficients which are calculated from the admittance matrix are shown. Spherical and planar cases were compared. Element patterns of spherical arrays in square and triangular lattices were also studied. Dissert. Abstr.

N77-12291 Drexel Univ., Philadelphia, Pa.
REDUCED ORDER MODELS FOR POWER SYSTEM ANALYSIS Ph.D. Thesis
Ashvanikumar Devshanker Bhatt 1976 215 p
Avail: Univ. Microfilms Order No. 76-22409

The development of two major reduction techniques which characterize slow speed dynamic phenomena is discussed. These reduced order models can be successfully applied to both linear and certain non-linear representations of a power system. A new approach to simplifying large linear dynamic systems is developed. A method of constructing a suboptimal control policy for a large system using the simplified model is developed. Three examples in the area of dynamic stability studies are considered to demonstrate the techniques developed. An approach to identifying coherent groups of generators is developed. The concept of coherency is developed from analyzing the eigenvectors of the linearized power system model. The concept of identifying coherent groups of generators is extended to include a more detailed model of a synchronous machine and its associated excitation and governing systems. By the modified definition of coherency, the coherent groups of the 39 bus sample test system are identified. Dissert. Abstr.

N77-12292*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SIMPLIFIER CUT CORE INDUCTOR DESIGN
W. T. McLyman 1 Nov. 1976 83 p refs Revised
(Contract NAS7-100)
(NASA-CR-149241; JPL-TM-33-697-Rev-1) Avail: NTIS HC A05/MF A01 CSCL 09A

Advantages of specifying C cores and cut toroids fabricated from grain oriented silicon steels for use in high frequency power converters and pulse width modulated switching regulators are discussed. A method for rating cores assigns to each core a number which is the product of its window and core cross section area, called 'Area Product A sub p.' A correlation between the A sub p numbers and current density for a given temperature rise was developed. Also, straight line relationships were developed for A sub p and volume, A sub p and surface area, and A sub p and weight. These relationships can be used to simplify and standardize the process of inductor design. They also make it possible to design inductors of small bulk and volume or to optimize efficiency. Author

N77-12293# Elektronikcentralen, Hoersholm (Denmark).
ELECTRONIC COMPONENTS: A SURVEY OF THE MOST USED COMPONENT TYPES, THEIR CHARACTERISTIC DATA, APPLICATIONS AND FAILURE RATES [ELEKTRONIK-KOMPONENTER: EN OVERSIGT OVER DE MEST ALMINDELIGE KOMPONENTTYPER, DERES KARAKTERISTISKE DATA, ANVENDELSE OG FEJLHYPPIGHED]
Joergen Biegel Jul. 1976 125 p refs In DANISH; ENGLISH summary
(ECR-62) Avail: NTIS HC A06/MF A01

Typical component families available today and a rule for their characteristic electrical data and failure rates are presented for circuit designers. Furthermore, guidance as well as limitations concerning application of components and their data are indicated. Author

N77-12294# Elektronikcentralen, Hoersholm (Denmark).
TRANSIENTS IN LOW VOLTAGE POWER SYSTEM: DESCRIPTIONS OF TRANSIENTS OBSERVED IN THE AREA OF COPENHAGEN IN SOME INDUSTRIES, HOSPITALS, OFFICES, LABORATORIES, ETC. [TRANSIENTER PA LAVSPAENDINGSNET: MAELING AF FOREKOMMENDE TRANSIENTER FORSKELLIGE STEDER I KOBENHAVN-SOMRAEDET I MILJOER SOM INDUSTRI, HOSPITAL, KONTOR, BEBOELSE ETC.]
J. Duvald Christensen Aug. 1976 71 p refs In DANISH; ENGLISH summary
(ECR-63) Avail: NTIS HC A04/MF A01

High frequency transients in the low voltage power system (distributed in underground cables) were recorded at 25 different places in the area of Copenhagen. The measuring period at each place was one week (5 working days). The places were selected so that different environments such as offices, hospitals, laboratories, industries, etc. were represented. The measuring set was connected between one of the phases and neutral. When no distribution transformer was provided at the place of measurement, the measuring set was connected to the main switchboard. Otherwise the measuring set was connected directly to the low voltage bus bars of the transformer or as close to them as possible. The measuring set has a built-in 50 Hz notch filter; accordingly, only the superimposed transient voltage was recorded. None of the recorded transients exceeded 300 volts. Author

N77-12295# Elektronikcentralen, Hoersholm (Denmark).
MICROSTRIPS FOR UHF AND MICROWAVES: AN EVALUATION OF SUBSTRATE MATERIALS AND METALLIZATION TECHNOLOGY FOR THIN- AND THICKFILM MICROSTRIPS
E. Sletten Sep. 1976 26 p refs
(ECN-19) Avail: NTIS HC A03/MF A01

Alternative technologies for fabricating microstrip circuits intended for use in the range 1-10 GHz were investigated. Both thickfilm technology (etched pattern) and thinfilm technology combined with gold plating were investigated. A ring resonator was used as a test structure, and the alternative technologies were evaluated by measurements of the quality factor. Thickfilm test structures were prepared on alumina ceramic substrates of

varying surface roughness as well as on zirconate substrates. Thinfilm test structures were prepared on conventional alumina substrates as well as on sapphire substrates. Author

N77-12296# Elektronikcentralen, Hoersholm (Denmark).
THICK AND THINFILM INDUCTORS: AN INVESTIGATION OF DESIGN AND MANUFACTURING PARAMETERS FOR VHF AND UHF INDUCTORS MADE IN FILM TECHNIQUES
E. Sletten Sep. 1976 38 p refs
(ECR-64) Avail: NTIS HC A03/MF A01

The electrical parameters are investigated for thickfilm and electroplated inductors at high frequencies (10 MHz - 2 GHz). Design formulas for the inductance of square spiral inductors are compared with measured inductances in order to verify the formulas. Moreover, the quality factor q and the resonance frequency of the inductors are measured. Inductors covered with ferromagnetic pastes were included as well as different types of crossovers and inductors with silicone coating. Author

N77-12297*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN 82 TO 84 PERCENT EFFICIENT, SMALL SIZE, 2 AND 4 STAGE DEPRESSED COLLECTOR FOR OCTAVE BANDWIDTH HIGH PERFORMANCE TWT'S
H. Kosmahl and P. Ramins 1976 9 p Presented at the Intern. Electron Devices Meeting, Washington, D. C., 6-8 Dec. 1976
(NASA-TM-X-73572; E-9021) Avail: NTIS HC A02/MF A01 CSCL 09A

Improvements were carried out on a TWT (traveling wave tube) for use in EMC (electronic countermeasure) systems by applying MDC (multi-stage depressed collector) and spent-beam refocusing techniques. The MDC geometric design consists of six collecting elements (electrodes) at ground and cathode potentials operating in 2 or 4 stage configuration. The refocusing system designed allows a controlled beam expansion to the point that space charge becomes negligible at the MDC entrance. Simultaneously, the standard deviation of the radial velocity (angular spread) is reduced. This system provides an analog real time readout of P(recovered). Data on all tests is obtained with an automated data acquisition system. I.M.

N77-12298# Florence Univ. (Italy). Ist. d'Elettronica.
ANALYSIS OF STRIP LINE DISPERSION [ANALISI DELLA DISPERSIVITA DELLE STRIP-LINES]
Mario Calamia, Mauro Maestrini, and Roberto Tiberio Jan. 1976 30 p In ITALIAN
(Contract CNR-73.00350.07)
Avail: NTIS HC A03/MF A01

Various existing methods of studying the dispersivity of a microstrip line are reviewed. Analytic methods are outlined. Numerical methods are detailed with regard to the finite difference theory and finite element method. Other techniques, such as models of the Getsinger and Carlin type or empirical methods, were analyzed. A general comparison of results obtained by using the different methods presented is made and discussed. ESA

N77-12299# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
FOLLOW-UP FILTER [FILTRE SUIVEUR]
D. Mathieu and A. Silvent 6 May 1975 21 p In FRENCH
(CEPHAG-23/75) Avail: NTIS HC A02/MF A01

An analog filter with three outputs for the same input and with the same cutoff frequency for all three outputs is presented. The tuning frequencies are made proportional to the dc command voltages. Thus the secondary resonances of a commutating filter can be reduced and the output signals may by smoothed out. ESA

N77-12300# Rome Air Development Center, Griffiss AFB, N.Y.
MICROCIRCUIT DEVICE RELIABILITY LINEAR/INTERFACE MICROCIRCUIT DATA
T. E. Paquette 1975 305 p refs
(Contract F30602-73-C-0065)
(AD-A019433; RAC-MDR-2) Avail: NTIS CSCL 09/5

The compendium of Microcircuit Reliability data is separated into two sections: Linear Devices and Interface Devices. Each section has a detailed breakdown of part level test and field results arranged by part manufacturer, and summarized data in the form of tables and charts. These summaries provide quick insight into: A comparison of observed field failure rates and MIL-HDBK-217B predicted values, failure rates of life test data, environmental test results, reliability demonstration test results, and failure classifications. GRA

N77-12301# Hughes Aircraft Co., Carlsbad, Calif. Industrial Products Div.
STORAGE CAMERA TUBE WITH NON-DESTRUCTIVE READOUT Interim Technical Report, 14 Jun. - 13 Sep. 1975
L. S. Yaggy Jan. 1976 19 p refs
(Contract DAAB07-75-C-1305; DA Proj. 1S7-62705-AH-94D)
(AD-A024280; ECOM-75-1305-2; ITR-2) Avail: NTIS HC A02/MF A01 CSCL 09/1

Progress during the 5th through the 7th months of this contract for further development of a storage camera tube is reported. Effort was concentrated in the area of 1.06 M quantum efficiency and resolution of this tube, which is capable of rapid switching between two modes: real-time television, and storage with non-destructive readout. Checkout of the new H1349 design, providing a 40-millimeter image format, proceeded in parallel with the target development. Questions of front and back surface target reflectivity and the efficient absorption of photons are addressed. Author (GRA)

N77-12302# Lincoln Lab., Mass. Inst. of Tech., Lexington.
HOW TO SWITCH A BEAM-FORMING NETWORK WITH MINIMUM DISTURBANCE TO EXISTING COMMUNICATION CHANNELS
L. K. DeSize and Alan J. Simmons 2 Apr. 1976 21 p refs
(Contract F19628-76-C-0002)
(AD-A025208; TN-1976-20; ESD-TR-76-74) Avail: NTIS HC A02/MF A01 CSCL 09/5

A beam-forming network (BFN) consisting of a tree of variable power dividers (VPD's) is typically used to divide the power among beams in a multiple-beam antenna. During the changeover from one set of beam configurations to another it is important that a user who is present in both configurations does not have his communication channel disturbed. A procedure is presented for systematically changing the VPD's, first to an intermediate configuration, and then to a final configuration, which avoids any disturbance to continuing users. Author (GRA)

N77-12303# Stanford Univ., Calif. Stanford Electronics Lab.
ADVANCED INTEGRATED-CIRCUIT TECHNOLOGY FOR MICROPOWER ICs. INTEGRATED CIRCUITS Final Report, 5 Jun. 1972 - 4 Dec. 1974
Thurman John Rodgers Dec. 1975 237 p refs
(Contract DAAB07-72-C-0229)
(AD-A025507; SU-SEL-75-034; ECOM-72-0229F) Avail: NTIS HC A11/MF A01 CSCL 09/5

A four-mask epitaxial v-groove (EVG) bipolar IC fabrication process uses a nonuniform N/N(-)/i layer and anisotropic etching of 1-0-0 silicon to eliminate conventional buried layer and isolation diffusions and to permit the use of an unmasked base diffusion. A five-mask EVG process permits fabrication of lateral pnp devices. The EVG structure offers simpler processing, smaller isolation capacitors, lower parasitic collector resistances, and larger packing densities than conventional processing. Reduced isolation capacitance provides good micropower performance. Process details are described. An epitaxial v-groove n-channel MOS (VMOS) logic structure suitable for 5-volt high-speed random logic was fabricated. GRA

N77-12304# Kentucky Univ., Lexington. Dept. of Electrical Engineering.
APPLICATIONS OF MULTICONDUCTOR TRANSMISSION LINE THEORY TO THE PREDICTION OF CABLE COUPLING. VOLUME 1: MULTICONDUCTOR TRANSMISSION LINE THEORY Final Report
Clayton R. Paul Apr. 1976 188 p refs 7 Vol.
(Contract F30602-72-C-0418; AF Proj. 4540)
(AD-A025028; RADC-TR-76-101-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09/1

The report is the first volume in a series of reports documenting

the Application of Multiconductor Transmission Line Theory to the Prediction of Cable Coupling. Modern avionics systems are becoming increasingly complex. These systems generally contain large numbers of wires connecting the various electronic equipments. The majority of the wires are in very close proximity to each other in either random cable bundles (in which the relative wire positions are not known or controlled) or in ribbon cables (in which the relative wire positions are known and controlled). The prediction of wire-coupled Interference in these cable bundles is of considerable importance in the prediction of overall system compatibility. It is the purpose fo this series of reports to examine the application of multiconductor transmission line theory to this problem. The first volume is intended to provide a comprehensive discussion of multiconductor transmission line theory on which the remaining volumes will be based. The remaining volumes will investigate the application of this theory to specific classes of problems. GRA

N77-12305# Kentucky Univ., Lexington.
APPLICATIONS OF MULTICONDUCTOR TRANSMISSION LINE THEORY TO THE PREDICTION OF CABLE COUPLING. VOLUME 2: COMPUTATION OF THE CAPACITANCE MATRIXES FOR RIBBON CABLES Final Report
Arthur E. Feather and Clayton R. Paul Apr. 1976 158 p refs 7 Vol.
(Contract F30602-72-C-0418; AF Proj. 4540)
(AD-A025029; RADC-TR-76-101-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 09/1

Multi-conductor ribbon cables using closely coupled dielectric-coated conductors are now used extensively to interconnect electronic subsystems. General techniques involving solution of the multiconductor transmission line equations can be used to predict unwanted interference or crosstalk in the cable. Inherent in these techniques is knowledge of the per-unit-length transmission line capacitance and inductance matrices of the ribbon cable. A computer implemented numerical technique for determining these matrices for ribbon cables is described. The per-unit-length charge distributions on the conductor and dielectric surfaces are described by Fourier series with the potential and displacement vector equations at these surfaces enforced as boundary conditions. A matric inversion technique is used to develop elements of the generalized and transmission line capacitance matrices. Computer program GETCAP was written in a user-oriented format. The user simply describes the physical characteristics, and GETCAP computes the per-unit-length capacitance matrices for the ribbon cable described. GRA

N77-12306# Power Electronics Associates, Inc., North Olmsted, Ohio.
ADVANCED POWER PROCESSING TECHNIQUES FOR DC TO DC CONVERTERS Interim Report, 1 Jul. 1974 - 30 Jun. 1975
Francisc C. Schwarz Apr. 1976 113 p refs
(Contract DAAB07-74-C-0568; DA Proj. 1S7-62705-AH-94P)
(AD-A025915; ECOM-74-0568-1; IR-1) Avail: NTIS HC A06/MF A01 CSCL 09/5

The study leading to a new type dc to dc converter with experimentally substantiated promise for appreciably lighter weight, such as one half or less, improved reliability and unimpaired efficiency in excess of 90% is presented. The functional principle is based on the transfer of power through controlled nonlinear resonant circuits. The resonant currents secure low turn off stresses, unlike the severe conditions of forced current interruption found in state of the art equipment. The maximum current and voltage stress levels of the transistors are unconditionally contained for all static and dynamic conditions of operation. Improved reliability is expected from the described lower stress levels.
Author (GRA)

N77-12307# TRW, Inc., Lawndale, Calif. Semiconductor Div.
PRODUCTION ENGINEERING MEASURE FOR AN INTEGRATED CIRCUIT POWER AMPLIFIER 600 - 1000 MHz, FOR TACTICAL RADIO EQUIPMENT Quarterly Report, 1 Jan. - 31 Mar. 1976
Roger C. DeBloois Mar. 1976 30 p
(Contract DAAB05-72-C-5844)
(AD-A025919; QR-16) Avail: NTIS HC A03/MF A01 CSCL 09/5

This project is intended to provide for production engineering to manufacture an amplifier with the following characteristics: 30 watts output power; input impedance, 50 ohms; output impedance, 50 ohms; and frequency band, 600-1,000 MHz. The amplifier will utilize the TRW MICroAMP(TM) broadband transistor which will be optimized as part of this project. Two of these devices will then be combined using 90 deg interdigitated couplers to produce a minimum of 30 watts of power. This amplifier will be adaptable for use as a building block for the fabrication of higher power systems. Actual commencement of the pilot run effort was held up during this quarter pending completion of internal planning and scheduling the pilot run. Author (GRA)

N77-12308# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
MILLIMETER DUAL HELIX TRAVELING-WAVE TUBE Triannual Report, 1 Nov. 1975 - 29 Feb. 1976
A. E. Manoly Apr. 1976 29 p
(Contract DAAB07-75-C-1368; DA Proj. 1S7-62705-AH-94)
(AD-A025104; EDD-W-06596-2; ECOM-75-1368-2; TAR-2)
Avail: NTIS HC A03/MF A01 CSCL 09/1

Assembly and brazing of gun structures has resulted in two complete gun assemblies. The fixturing produced close tolerances needed for the small gun sizes. A barrel assembly complete with pole pieces has been brazed and awaits a final sizing broach. Problems with the initial broach were solved by fabricating the barrel sections by milling, brazing and final machining. Several RF circuits have been laser welded, copper coated and brazed. One circuit is complete with six attenuated support rods attached ready to heat shrink. The use of a stripline in conjunction with a two section quarter wave transformer has produced a good match over the band. Author (GRA)

N77-12309# DARCOM Intern Training Center, Texarkana, Tex.
A SURVEY OF COMPUTER-AIDED ELECTRONIC CIRCUIT DESIGN PROGRAMS Final Report
J. A. Moore Apr. 1976 72 p refs
(AD-A024768; DARCOM-ITC-02-08-76-016) Avail: NTIS HC A04/MF A01 CSCL 09/5

Two computer-aided circuit design programs and a design system for linear integrated circuits are examined, and their features and capabilities are discussed. The programs are MAGIC and CIRCAL-2, two programs which are capable of handling a large class of design problems. The design system for integrated circuits aids the user in all phases of integrated circuit design. GRA

N77-12310# Boeing Aerospace Co., Houston, Tex.
SOFTWARE SNEAK CIRCUIT ANALYSIS Final Report
John P. Rankin, Gary J. Engels, and Sylvia G. Godoy Kirtland AFB, N. Mex. AFWL Apr. 1976 146 p refs
(Contract F29601-75-C-0069)
(AD-A024718) Avail: NTIS HC A07/MF A01 CSCL 09/2

The purpose of this study was to determine the feasibility of using the existing electrical sneak circuit analysis techniques to find software sneak circuits. The technique developed is unique in that it uses topological pattern recognition methods to identify software errors in assembler language subroutines. The approach involved research to identify case history software problems and collect computer listings that contained the problems. The case history problems were analyzed, and electrical analogies were developed to depict the software instructions in electrical network trees. Techniques were developed that would identify these problems. Next, the developed techniques were applied to five test subroutines to determine the effectiveness of software sneak circuit analysis. The application identified several problems that had previously gone undetected. Finally, the developed techniques were compared to other existing methods of software verification. It is concluded that the developed technique will find at least the types of problems studied. GRA

N77-12311# Harry Diamond Labs., Adelphi, Md.
SURVEY OF RADIATION EFFECTS IN METAL INSULATOR SEMICONDUCTOR DEVICES
Arnold S. Epstein and Harvey A. Eisen Nov. 1975 123 p refs
(AD-A024809; HDL-TR-1731) Avail: NTIS HC A06/MF A01 CSCL 09/1

This report reviews the effects of radiation on metal-insulator-semiconductor (MOS) devices. It briefly provides some of the background physics, chemistry, and analytical tools needed to discuss the MOS structures, and then reviews the effects of radiation on the characteristics of the devices. Most of the review concerns device fabrication and the processes that have been considered for improving radiation resistance of devices. Finally, the present status of the MOS technology is discussed, as well as remaining problems that must be solved to make the MOS technology applicable to radiation environments and to large-scale integration. GRA

N77-12312# RCA Government Communications Systems, Somerville, N.J. Advanced Communications Lab.
LOW LOSS LOW HOLD POWER DIODE PHASE SHIFTER DEVELOPMENT Final Report, Nov. 1974 - Feb. 1976
Leon L. Stevens Griffiss AFB, N. Y. RADC Apr. 1976 52 p refs
(Contract F30602-75-C-0068; AF Proj. 5573)
(AD-A024779; RADC-TR-76-88) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report covers the design and test results on a Metal-Insulator-Semiconductor diode phase shifter operated at 3.5 GHz. The four bit phase shifter required less than 1 microamp of bias current in any phase shift state. The breadboard model was tested over a 5% bandwidth with 3.65 db of insertion loss, 100 mw of power handling capability, and 50 nanoseconds of switching rise time. GRA

N77-12313# Army Electronics Command, Fort Monmouth, N.J.
UV/OZONE CLEANING OF SURFACES
John R. Vig and John W. LeBus Apr. 1976 21 p refs
(DA Proj. 1S7-62605-AH-94)
(AD-A024943; ECOM-4397) Avail: NTIS HC A02/MF A01 CSCL 13/6

The UV ozone cleaning procedure is shown to be an effective method of rapidly removing a variety of contaminants from surfaces. It is a simple-to-use dry process which is inexpensive to set up and operate. It can produce clean surfaces in air, at ambient temperatures. The experiments were performed on quartz and metal surfaces. The contaminants which were successfully removed include oils and greases (including silicones), fluxes, skin oils, and contamination absorbed during prolonged exposure to air. The important variables are: the contaminants initially present, the precleaning procedure, the wavelengths emitted by the UV source, the atmosphere between the source and sample, the distance between the source and sample, and the time of exposure. For surfaces which are properly precleaned and placed within a few millimeters of an ozone producing UV source, the process can consistently produce a clean surface in less than one minute. Experiments performed with two low pressure Hg discharge UV sources, one which generates ozone and one which does not, indicate that the combination of short wave UV plus ozone produces a clean surface substantially faster than either short wave UV without ozone or ozone without UV. GRA

N77-12314# General Electric Co., Syracuse, N.Y. Heavy Military Equipment Dept.
FLUID COOLING OF HIGH POWER DENSITY SEMICONDUCTOR DEVICES
B. K. Erickson Jan. 1976 68 p refs
(AD-A025815; R76EMH5) Avail: NTIS HC A04/MF A01 CSCL 09/5

Dielectric coolant fluids operating in an evaporation-condensation cooling cycle were investigated to determine how much they could reduce the surface temperature of high power density semiconductor devices. A brief description of the process reveals that the air-side thermal resistance of the condenser and the critical heat flux density of the fluid at the semiconductor surface are problem areas. The thermal resistance and time constant of several TRAPATT diodes and microwave transistors were measured. The heat flux density at the surface of the TRAPATT diodes was too high to be compatible with conventional fluids. The junction temperature of microwave transistors was consistently reduced 10 C, and the process has a potential application in this area. Author (GRA)

N77-12315# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
INTERMODULATION STUDY Final Technical Report, Jul. 1974 - Dec. 1975
Otto Sauseng Griffiss AFB, N. Y. RADC May 1976 78 p refs
(Contract F30602-74-C-0304; AF Proj. 5573)
(AD-A025689; W-06115; RADC-TR-76-119) Avail: NTIS HC A05/MF A01 CSCL 09/5

Methods for reducing capture effects and intermodulation distortion in broadband traveling-wave tubes have been investigated theoretically and experimentally. Considered primarily were techniques that involve interaction of electron beam and slow wave circuit both at the fundamental and at the harmonic frequency range. It was found that significant improvements in tube linearity can be achieved when such a tube is simultaneously driven by the fundamental frequency signals as well as by their first harmonics. When amplitude and phase of the injected harmonic signals are optimized at saturation, spurious harmonic output power is reduced by more than 10 dB, while fundamental output power and efficiency is about doubled. In multi-tone operation third order intermodulation is then improved by about 6 dB to 8 dB. For broadband applications, the required harmonic signals can conveniently be generated by a wideband driver TWT that is operated in its non-linear range. The design of a driver and output tube chain is described that utilizes harmonic injection over a large frequency range. The tube chain is designed to produce gain and power over a nearly two-octave bandwidth with harmonic injection improvements available over the lower half of the total frequency range. Author (GRA)

N77-12316# EIMAC, San Carlos, Calif.
MULTIMODE PHASED ARRAY TUBE Final Technical Report, 15 Apr. 1974 - 17 Jan. 1976
Raymond F. Rinaudo, William H. Sain, and Robert I. Sutherland Griffiss AFB, N. Y. RADC May 1976 61 p
(Contract F30602-74-C-0158; AF Proj. 5573)
(AD-A025691; EIMAC-TR-76-1; RADC-TR-76-127) Avail: NTIS HC A04/MF A01 CSCL 09/5

This contract was for the test and evaluation of the tetrode type 8590/4CPX250K for long pulse and high duty factor service in phased array applications. The limits of the tube were determined. Also, a new tetrode with the same size and outline of the 8590 was developed to provide pulse lengths to 10ms with a duty factor to 0.03. The new tetrode uses a CPC (coated powder cathode) and a new anode cooler design to permit an anode dissipation of 500 watts. An rf cavity to work with the new tetrode was developed to operate at 435 MHz with 10kw output power. A bandwidth of 30 MHz to the -1dB points was attained using overcoupled circuits. The power gain of the tube and cavity combination was over 10dB.
Author (GRA)

N77-12317# Environmental Research Inst. of Michigan, Ann Arbor.
THERMOPLASTIC MODULATOR BRASSBOARD Final Report, Jun. 1974 - Jun. 1975
Ivan Cindrich, G. D. Currie, C. Leonard, and R. Salmer Wright-Patterson AFB, Ohio AFAL Mar. 1976 118 p
(Contract F33615-74-C-1208; AF Proj. 2001)
(AD-A025450; ERIM-110100-14-F; AFAL-TR-75-165) Avail: NTIS HC A06/MF A01 CSCL 09/5

A real-time, two dimensional optical data modulator was constructed at ERIM and delivered to the Air Force Avionics Laboratories/TEL. This report is divided into two parts. The first part describes the design of the modulator and the second part is an instruction manual. The modulator utilizes electron beam writing on a deformable thin thermoplastic film that is reusable. The real-time thermoplastic modulator was designed for experimental flexibility. The recording plastic layer is reusable. Operating parameters were optimized for coherent optical spectrum analysis of the recorded data. Electronic controls allow for a variation in values selected for electron beam sweep speed, raster size, and thermoplastic temperature. The recording faceplate and electron gun are demountable from the recording envelope. The device described in this report is a versatile two-dimensional real-time modulator having the quality required for coherent optical data processing with a large time-bandwidth

product and a storage time having a very large range of variation. It is useful in a variety of applications in its present form and further advancements can be made, particularly in the area of size reduction and increased temporal and spatial bandwidth. GRA

N77-12318# Alcoa Conductor Products Co., Massena, N. Y. Electrical Products Div.

HIGH-VOLTAGE TRANSMISSION CONDUCTOR MOTION RESEARCH Final Report

C. B. Rawlins Jun. 1976 209 p refs Sponsored by Electric Power Research Inst.

(PB-255768/4; EPRI-TD-172) Avail: NTIS HC A10/MF A01 CSCL 09A

The purpose of the program is to develop the technology required for design of bundle lines and for alteration of existing lines to prevent the oscillations. The investigation to date has encompassed a program of measurements of oscillation behavior of existing lines, measurements of turbulence of natural winds to which the lines are exposed, wind tunnel measurements of aerodynamic characteristics of conductors in bundles, and development of theoretical and computer analyses for predicting conditions under which actual spans may oscillate. The computer analyses used with the wind tunnel data developed in the program, provide a useful tool for predicting the effectiveness of devices and procedures intended to prevent oscillation. The influence of local terrain is taken into account. GRA

N77-12319# Naval Research Lab., Washington, D.C.

DEVELOPMENT OF A SUPERCONDUCTING ELF RECEIVING ANTENNA Interim Report

John R. Davis, Robert J. Dinger, and Joseph Goldstein 9 Apr. 1976 23 p refs

(NRL Proj. R07-34; XF21222035)

(AD-A024666; NRL-7990) Avail: NTIS HC A02/MF A01 CSCL 09/5

The development of an ELF submarine receiving antenna that uses a triaxial array of superconducting quantum interference devices (SQUIDs) has addressed the achievement of a SQUID sensor with a sensitivity of 0.01 picotesla per hertz to the 1/2 power, achievement of a SQUID linear dynamic range of 140 dB, achievement of sensor orthogonality of 0.1 milliradian, stabilization of receiver platform motion to 1 milliradian, processing of SQUID outputs to remove residual motion noise, and provision of a suitable cryogenic environment. The required sensitivity, linear dynamic range, and sensor orthogonality were obtained in a prototype point-contact-type triaxial SQUID magnetometer used to detect the ELF signal from the Navy test transmitter in Wisconsin. The required platform stabilization was demonstrated in a towing basin by motion spectrum measurements on a hydrodynamically stabilized buoy designed to be towed by a submarine. Motion excursions within the ELF passband of 30 to 130 Hz were about a microradian; hence motion-generated noise must be further reduced by about 80 dB. This noise in the ELF signal can be reduced by adaptively determining a vector approximately equal to the earth's magnetic field vector and combining it vectorially with the SQUID outputs. This adaptive processing has been studied using a computer simulation of the SQUIDs and motion noise. A prototype dewar capable of fitting a towed communication buoy maintained a volume large enough for a triaxial SQUID sensor package at the temperature of boiling liquid helium for 102 days. Author (GRA)

N77-12320# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Guidance and Control Directorate.

ASYMMETRICAL OSCILLATIONS IN NONLINEAR SYSTEMS

R. E. Yates, Y. T. Tsay, and C. F. Chen 1 Apr. 1976 25 p

(DA Proj. 1M3-62303-A-214)

(AD-A024673; RG-76-59) Avail: NTIS HC A02/MF A01 CSCL 09/5

A method to obtain the AC and DC describing functions of asymmetrical nonlinear systems is presented. The method is further extended allowing determination of the asymmetrical oscillations from a given transfer function and its nonlinear input. Examples are included illustrating the use of this method for various nonlinearities. Author (GRA)

N77-12321# Epsco Labs., Wilton, Conn.

DEVELOPMENT OF A SPEECH AMPLIFIER SYSTEM FOR USE WITH THE NAVY A4 OXYGEN BREATHING APPARATUS AND A PROPOSED FIREFIGHTING INSTRUCTOR'S BREATHING DEVICE Final Report

Thomas A. Giordano Apr. 1976 28 p refs

(Contract N00024-75-C-4112)

(AD-A025184) Avail: NTIS HC A03/MF A01 CSCL 09/5

Navy damage control personnel (especially firefighters) are often required to work in areas of possible or actual oxygen deficiency and areas where the concentration of smoke or other toxic gases is high. In these situations, the investigator or firefighter normally wears an Oxygen Breathing Apparatus (OBA) for respiratory protection. Presently, the Naval Ship Engineering Center is considering the use of two new breathing devices. Neither breathing device was originally equipped with an amplified speech communication system. In order to make possible good face-to-face communication in the high noise environments anticipated, it was deemed desirable that some of these devices be provided with suitable voice amplifiers. Author (GRA)

N77-12322# Pittsburgh Univ., Pa. Dept. of Electrical Engineering.

FEASIBILITY STUDY OF THE USE OF CURRENT LIMITING DEVICES IN INTERRUPTION AND SECTIONALIZING OF DC CIRCUITS IN MINES

Howard B. Hamilton and Teofilo J. Ramos Feb. 1976 150 p refs

(Contract DI-BM-HO-357079)

(PB-256541/4; BM-OFR-94-76) Avail: NTIS HC A07/MF A01 CSCL 08I

Feasibility is determined for using current limiting devices (CLD) in switching heavy DC currents (1,200 and 600 amperes) at utilization voltages used in the mining industry (300 and 600 volts, nominal). Use of a CLD in this application is based on its orders of magnitude change in resistance when it changes state (from liquid mercury to vapor) after being subjected to short time, high density current. Switching times on the order of 3 to 4 milliseconds have been obtained. GRA

N77-12323# Honeywell, Inc., Golden Valley, Minn. Ceramics Center.

MANUFACTURING METHODS AND TECHNIQUES FOR PIEZOELECTRIC TRANSFORMERS Quarterly Progress Report, 14 Oct. 1974 - 14 Jan. 1976

William B. Harrison, L. Hiltner, W. Kammeyer, R. Kyle, and T. Rudy Jan. 1976 59 p

(Contract DAAB07-76-C-0008)

(AD-A025176; QPR-2) Avail: NTIS HC A04/MF A01 CSCL 09/1

The second Quarterly Report for Contract DAAB07-76-C-0008 describes the progress and status of this program to establish a cost-effective production capability for 18mm and 25mm piezoelectric ceramic transformers. Progress toward building the first engineering samples is reviewed, and the interconnection techniques for the 18mm package are discussed. Author (GRA)

N77-12324# Harry Diamond Labs., Adelphi, Md.

TRANSIENT CURRENTS IN PARTIALLY SHIELDED CONDUCTORS: A CIRCUIT MODEL

Richard L. Monroe Nov. 1975 25 p refs

(DNA Proj. NWER-QAXEB075)

(AD-A025135; HDL-TR-1736) Avail: NTIS HC A02/MF A01 CSCL 09/1

The note presents a resistive-inductive circuit representation of the coupling of transient currents to partially shielded conductors. The current coupled to the inner conductors is computed in terms of the shield current by use of lumped parameters directly related to the specific geometry of a given problem. The model is applied to an example where experimental data are available; the peak value of the coupled current is a significant fraction of the exciting current; that is, the shield is effectively short-circuited. GRA

N77-12325# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.

INVESTIGATION OF PIEZOELECTRIC EFFECT IN PERMA-

NENTLY POLARIZED OXIDE GLASSES AND GLASS-CERAMICS Technical Rept. Report 1975-1976
Joseph H. Simmons, Paul B. Elterman, and Catherine J. Simmons May 1976 27 p refs
(Contract N00014-75-C-0707; NR Proj. 032-554)
(AD-A025144; TR-1) Avail: NTIS HC A03/MF A01 CSCL 09/1

Experiments were conducted to determine appropriate compositions for glasses for the fabrication of acoustic transducers. Glasses made by conventional melting did not demonstrate sufficiently high silica content to allow development of the electret effect. Glasses made by the vycor process and doped with a variety of conducting materials were used. This approach provides glasses with sufficiently high silica content to allow for permanent polarization and use as electrets. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N77-12326 Johns Hopkins Univ., Baltimore, Md.
VISCOUS EFFECTS IN WATER WAVES Ph.D. Thesis
An-Kuo Liu 1976 135 p
Avail: Univ. Microfilms Order No. 76-22933

The problem of mass transport induced by waves is reexamined. A two-dimensional gravity water wave is studied. The wave is assumed to be periodic in space at time t = 0. As time progresses, the viscous attenuation in time is examined, and the full Eulerian wave field is calculated by matched asymptotic expansions in space for small wave amplitude and by multiple scales in time. Under the usual boundary layer assumptions, the whole field is divided into three regions: surface boundary layers, bottom boundary layers and the interior. Then, by considering the mean momentum equation, the mass transport velocity is derived for both progressive and standing waves. Dissert. Abstr.

N77-12327 Lehigh Univ., Bethlehem, Pa.
AN EMPIRICAL TECHNIQUE FOR PREDICTING FLOW CURVES Ph.D. Thesis
Frank William Koko, Jr. 1976 140 p
Avail: Univ. Microfilms Order No. 76-21817

A technique was developed to predict flow curves which express the relationship between pressure drop and the flow rate of a specific fluid through a specific flow geometry. The particular case where other fluids can be pumped through the geometry of interest, but the fluid of interest cannot be, is considered. Dissert. Abstr.

N77-12328 National Lending Library for Science and Technology, Boston Spa (England).
RADIATIONAL HEAT EXCHANGE BETWEEN SURFACES WITH ANISOTROPIC RADIATION
B. S. Mastryukov and V. V. Zubov 1975 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 11, 1975 p 165-169
(NLL-M-25350-(5828.4F)) HC A02/MF A01

The special features of heat exchange by radiation in geometrical systems are examined with consideration of anisotropy of radiational properties of the surfaces. Acceptance of the validity of Lambert's law leads to substantial errors in calculation, which depend on the mutual arrangement of the surfaces and the nature of the spatial distribution of radiation. Author

N77-12329*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PARAMETERS AFFECTING ELECTROSTATIC COOLING
K. E. Demorest and R. L. Gause Nov. 1976 28 p
(NASA-TM-X-73350) Avail: NTIS HC A03/MF A01 CSCL 20D

A high voltage electrostatic field is discussed which enhances the rate of normal convective cooling. This cooling rate is a function of starting temperature and voltage applied, and an inverse function of atmospheric pressure or the heat capacity of the surrounding media. It appears that the cooling rate is also a function of current flow; however, additional work is needed to separate other variables from the effect of current flow. The maximum increase in heat loss over the normal convective cooling was approximately 0.167 C/sec (0.3 F/sec) at 316 C (600 F) and 20,000 V. From the data taken it is assumed that the addeded rate of cooling would be increased with higher temperatures and higher voltages. It appears that a high voltage field disrupts the molecular layer of air surrounding a hot body and increases the rate of convective cooling. Author

N77-12330# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
STUDY OF EVAPORATION AND CONDENSATION PROBLEMS BY KINETIC THEORY, VOLUME 41, NO. 5
Tadashi Matsushita May 1976 113 p refs
(ISAS-541) Avail: NTIS HC A06/MF A01

The half-space evaporation and condensation problem is investigated by using the linearized BGK model equation and the finite element method. Numerical predictions of microscopic and macroscopic temperature and density slip coefficients based upon the finite element method are compared with alternative numerical results. The method is applied to the two-surface evaporation and condensation problem to obtain the density and temperature distributions in the vapor phase and the mass flux from the high temperature surface to the low one for the various inverse Knudsen numbers. The negative temperature gradient in the vapor phase between the two surfaces is observed in some particular conditions and explained from the kinetic theory viewpoint. Furthermore, by employing the finite element method to the two-surface evaporation and condensation problem in the presence of noncondensable gas, the effects of the noncondensable gas on the mass flux and on the negative temperature gradient are investigated. For the description of this problem, the linearized GK model equations are used. As a result, it is found that the presence of noncondensable gas plays a decisive role in retarding the mass flow rates and makes the occurrence of the negative temperature gradient difficult. Author

N77-12331# Royal Inst. of Tech., Stockholm (Sweden).
A CONSISTENT FINITE-DIFFERENCE OPERATOR FOR TIME-DEPENDENT SOLUTION OF STEADY, OBLIQUE SHOCKS
Lasse K. Karlsen 20 Sep. 1976 14 p refs
(KTH-Aero-FI-47; TRITA-FPT-022) Avail: NTIS HC A02/MF A01

An extension of the MacCormack finite-difference scheme for gasdynamic flows is presented. The new operator is shown to be consistent with the steady state jump conditions as well as the governing partial differential equations in smooth regions. The operator is tested on a steady, oblique shock with supersonic-supersonic transition. When started from the weak solution obtained by the basic MacCormack scheme, the presented procedure converged to the exact solution. Author

N77-12332*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUXILIARY POWER SYSTEM FOR ACTIVITY COOLED AIRCRAFT Patent Application
Robert A. Jones, inventor (to NASA) Filed 24 Nov. 1976 9 p
(NASA-Case-LAR-11626-1; US-Patent-Appl-SN-744542) Avail: NTIS HC A02/MF A01 CSCL 20D

A method is described for extracting heat energy from an active cooling system in an aircraft as a source of auxiliary power. A secondary coolant such as a water-glycol mixture removes heat from near the outer surfaces of the vehicle and circulates through a heat exchanger. Cryogenic fuel such as liquid hydrogen is first pressurized and passed through the heat exchanger and a turbine on its way to the engine. The temperature of the fuel is raised in the heat exchanger to a value above that which is required for the engine, because the fuel temperature and pressure will drop across the turbine. The turbine converts this excess heat to provide energy to pressurize the fuel, circulate the secondary coolant and drive other aircraft equipment. Author

N77-12333*# Sperry Support Services, Huntsville, Ala.
ANALYSES OF ACPL THERMAL/FLUID CONDITIONING SYSTEM
L. A. Stephen and L. H. Usher 29 Oct. 1976 47 p ref
(Contract NAS8-32016)
(NASA-CR-149166) Avail: NTIS HC A03/MF A01 CSCL 20D

Results of engineering analyses are reported. Initial computations were made using a modified control transfer function where the systems performance was characterized parametrically using an analytical model. The analytical model was revised to represent the latest expansion chamber fluid manifold design, and systems performance predictions were made. Parameters which were independently varied in these computations are listed. Systems predictions which were used to characterize performance are primarily transient computer plots comparing the deviation between average chamber temperature and the chamber temperature requirement. Additional computer plots were prepared. Results of parametric computations with the latest fluid manifold design are included. Author

N77-12334# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
JET IMPINGEMENT OF A CURVED SURFACE
Shiva Kumar Ojha and Satyanarayana Gollakota 26 Apr. 1976 61 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Mar. 1977
Avail: NTIS HC A04/MF A01

The impingement of a steady, two dimensional incompressible jet over a curved surface is studied. The flow regime in the neighborhood of the stagnation point is divided into inviscid and viscous flow regions. Inviscid flow solution is obtained by solving the full Euler's equations in curvilinear coordinates. The viscous flow is analyzed by the method of matched asymptotic expansions giving rise to zeroth and first order boundary layers, the latter accounting for the effects of longitudinal surface curvature. The numerical solutions obtained are valid in the impingement region extending approximately to one local free jet width on either side of the stagnation point. Skin friction decreases with decrease in curvature, and the contribution of first order skin friction is positive (negative) for concave (convex) surfaces. Author

N77-12335*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CALCULATION OF TRANSONIC FLOWS USING AN EXTENDED INTEGRAL EQUATION METHOD
David Nixon (Queen Mary Coll., London) 16 Jul. 1976 25 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Mar. 1977
(NASA-TM-X-74227) Avail: NTIS HC A02/MF A01 CSCL 20D

An extended integral equation method for transonic flows is developed. In the extended integral equation method velocities in the flow field are calculated in addition to values on the aerofoil surface, in contrast with the less accurate 'standard' integral equation method in which only surface velocities are calculated. The results obtained for aerofoils in subcritical flow and in supercritical flow when shock waves are present compare satisfactorily with the results of recent finite difference methods. Author

N77-12336# National Aerospace Lab., Kakuda (Japan). Solid Rocket Section.
SECONDARY GAS INJECTION INTO A SUPERSONIC CONICAL NOZZLE
Goro Masuya, Nobuo Chinzei, and Shinichi Ishii 29 Jun. 1976 36 p refs Backup document for AIAA Synoptic scheduled for publication in the AIAA Journal in Mar. 1977
Avail: NTIS HC A03/MF A01

Secondary injection thrust vector control (SITVC) of a rocket motor, attitude control of a flight vehicle by side jet, and transverse fuel injection into a supersonic combustor have been studied. Two types of pressure probes were used, and wall static pressure was also measured. The measurements indicate that flow field downstream of the injection port was composed of some elementary parts which were discerned due to their physical features. The flow structure development downstream and the effect of the injection pressure on the flow structure together with the effect of secondary injection on the separation at the nozzle exit in the case of over-expanded main stream are also presented. Author

N77-12337# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
MEAN FLOW AND TURBULENCE MEASUREMENTS IN THE WAKE OF SLENDER PROPELLER-DRIVEN BODIES INCLUDING EFFECTS OF PITCH ANGLE
J. A. Schetz, E. B. Daffan, A. K. Jakubowski, S. Cannon, R. Cox, and D. Dubberley Jul. 1976 105 p refs Backup document for AIAA Synoptic, 'Aero/Hydrodynamic Forces and Moments on Self-Propelled Slender Bodies in Incompressible Flow', scheduled for publication in Journal of Hydronautics in Apr. 1977
(Contract N00014-75-C-0763; ARPA Order 1910; NR Proj. 062-481)
(AD-A031088; VPI-Aero-050) Avail: NTIS HC A06/MF A01 CSCL 01/1

Studies of the turbulent wake behind a slender, propeller driven body were conducted in a low speed wind tunnel at nominal conditions of Re sub D = 4.4 = 100,000. Two models, both with the same nose and middle body, were tested. Wake surveys at Z/D = 2, 10, and 40 were made with a single propeller model at pitch angles of 0 and -2 deg and with a model with dual, side by side propellers at zero pitch angle. The variations of mean axial velocity, velocity vector orientation, static pressure and axial turbulence intensity were documented. Force and moment data for both models at pitch angles from -6 deg to +6 deg were obtained. Profiles of the boundary layer on the body ahead of the propeller were also measured. The data obtained, taken as a whole, provide a detailed picture of the development of these complicated flow fields. Author

N77-12338# European Space Agency, Paris (France).
INVESTIGATION OF BOUNDARY LAYER-LIKE FLOWS WITH PRESSURE GRADIENTS AT HIGH FREESTREAM MACH NUMBERS
Ernst Heinrich Hirschel Nov. 1976 78 p refs Transl. into ENGLISH of 'Untersuch. grenzschichtaehnlicher Stroemungen mit Druckgradienten bei grossen Anstroem-Machzahlen', DFVLR, Cologne Report DLR-FB-76-22, 16 Mar. 1976 Original report in GERMAN previously announced as N76-31481 Original German report available from DFVLR, Cologne DM 31
(ESA-TT-348; DLR-FB-76-22) Avail: NTIS HC A05/MF A01

The applicability of numerical methods for the solution of systems of partial differential equations, the mathematical difficulties, and the demands on flow physics which arise due to the use of these solution methods are discussed by means of theoretical investigations of boundary-layer-like flows with pressure gradients in main-stream direction and cross-flow direction. The flowfields investigated are hypersonic-slipflow boundary layers and structures of oblique shock waves and their intersections. In both cases a mixed initial value-boundary value problem must be solved which is described by governing equations derived from the Navier-Stokes equations. Results of calculations and comparisons with experimental data are presented.
Author (ESA)

N77-12339# European Space Agency, Paris (France).
SIMILAR SOLUTIONS OF THE DIFFERENTIAL EQUATIONS FOR MEAN VELOCITIES, TURBULENCE ENERGY AND TURBULENCE LENGTH
Julius Christian Rotta, Heinrich Vollmers et al Nov. 1976 79 p refs Transl. into ENGLISH of "Aehnliche Loesungen der Differentialgleichungen fuer gemittelte Geschwindigkeiten, Turbulenzenergie u. Turbulenzlaenge", DFVLR, Goettingen, West Ger. Report DLR-FB-76-24, 31 Mar. 1976 Original report in GERMAN previously announced as N77-10479 Original German report available from DFVLR, Cologne DM 37.40
(ESA-TT-354; DLR-FB-76-24) Avail: NTIS HC A05/MF A01

The system of partial differential equations to describe the mean velocities, the kinetic energy of fluctuations, and the characteristic length scale of turbulent flow was reduced to a system of ordinary differential equations using similarity transformations. The equations were solved numerically for six cases (plane free jet, plane wake, free mixing layer, fully developed plane channel flow, axisymmetric free jet, and fully developed

pipe flow). The influence of the empirical coefficients of the equations on the solutions was studied. A single set of coefficients, which results from the investigations, was taken as a basis to compare the calculated results with experimental data. Agreement between theory and experiment is, on the whole, satisfactory. Author (ESA)

N77-12340# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
UNSTEADY TRANSONIC FLOW WITH HEAT ADDITION
Martin Sichel Feb. 1976 42 p refs Prepared by Mich. Univ., Ann Arbor
(Contract N00014-75-C-1143; Proj. SQUID; NR Proj. 098-038) (AD-A024737; SQUID-TR-MICH-15-PU) Avail: NTIS HC A03/MF A01 CSCL 20/4

Unsteady transonic flows induced by the heat released during condensation of water vapor near the throat of a converging-diverging nozzle have been observed by Wegener and Cagliostro (1973) among others. Unsteady transonic flows with heating may also arise in air blast circuit breakers and in various processes involving the flow of chemically reactive gases. A theory for such flows is developed. The flow is shown to be isentropic and irrotational to first order. Small disturbance potential equations are derived. The oscillatory flows observed by Wegener and Cagliostro are shown to fall in the slowly time varying regime. An exact solution of the slowly time varying equations is found for flow near the throat of a nozzle with uniformly distributed oscillatory Joule heating. GRA

N77-12341# Newark Coll. of Engineering, N.J. Dept. of Mechanical Engineering.
DEPOSITION OF SUSPENSIONS IN LAMINAR FLOW Final Report, Sep. 1974 - Nov. 1975
Robert A. Comparin, Rong-Yaw Chen, and Shawki M. Eldighidy Nov. 1975 167 p refs
(Contract DAAG39-75-C-0059; HDL Proj. 302431) (AD-A025886; HDL-CR-75-059-1) Avail: NTIS HC A08/MF A01 CSCL 13/7

The deposition of suspensions in laminar flow was considered with special emphasis on the types of flow that result with the geometrical configurations in a typical laminar proportional amplifier. An analytical investigation of the mechanics of deposition has been made and a mathematical model developed for the deposition process. The analysis indicates that the most important effects are due to surface adhesive forces and electrostatic charges on the particles. Experiments with a simple contamination modeling system indicate that significant electrostatic charges can accumulate on the particles. GRA

N77-12342# Aeronautical Research Associates of Princeton, Inc., N.J.
ANALYSIS OF SUPERSONIC UNSTEADY CASCADES WITH THE METHOD OF CHARACTERISTICS, VOLUME 1 Final Report, 22 Apr. - 22 Dec. 1975
John E. Yates Dec. 1975 68 p refs
(Contract F33615-75-C-3102; AF Proj. 1370) (AD-A025909; ARAP-263; AFFDL-TR-75-159-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

A finite unsteady supersonic cascade is analyzed with the method of characteristics. The cascade can be placed between fixed rigid walls or in a free stream. Linearized aerodynamic theory is used throughout the present study. The full Kutta condition is imposed at the trailing edge, but a modified wake condition can be used whereby the wake strength is permitted to decay with downstream distance. The lift and moment coefficients are calculated on all blades in the cascade with only one blade excited in translation or rotation at a single frequency. To check the accuracy of the numerical scheme, results are presented for a single blade and compared with the exact theory. GRA

N77-12343# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE COMPUTATION OF STRONGLY UNDEREXPANDED SUPERSONIC SUBMERGED JETS
M. Ia. Ivanov and V. I. Kireev 6 May 1976 8 p refs Transl. into ENGLISH from Zh. Vychisl. Matem. i Matem. Fiz. (Moscow), v. 16, no. 3, 1976 p 750-757
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Illinois 60616

A finite difference method and a thorough computation method are described for clarification of regularities of off-design axisymmetric ideal gas jet propagation in a vacuum, in a submerged space, and in a coflow. A method is presented for analyzing spatial jets or jet problems with complex shock configurations in the stream domain. Longitudinal boundaries of computational cells are superposed on the streamlines to isolate them during the solution. The scheme obtained is similar to those using a Lagrange computational mesh in the numerical integration of gas dynamics. A.H.

N77-12344# Pennsylvania State Univ., University Park.
THE NUMERICAL SOLUTION OF THE STEADY FLOW OF NEWTONIAN AND NON-NEWTONIAN FLUIDS THROUGH A CONTRACTION Ph.D. Thesis
Thomas B. Gatski 28 Oct. 1975 147 p refs
(Contract N00017-73-C-1418)
(AD-A025774; TM-75-255) Avail: NTIS HC A07/MF A01 CSCL 20/4

The equations describing the steady two-dimensional flow of a dilute suspension of macromolecules, a non-Newtonian fluid, are numerically modeled using a finite difference technique. The flow domain is composed of a parallel walled inflow region, a contraction region in which the walls are rectangular hyperbolae, and a parallel walled outflow region. The problem is formulated in terms of the vorticity, stream function and appropriate rheological equation of state, the constitutive equation. An explicit differencing scheme is used to model the governing equations, with the advection terms in the equations modeled using upstream differencing. The structure of the basic Newtonian solvent flow is examined, and estimates of boundary layer thickness and discretizing errors are discussed. GRA

N77-12345# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
REFLOOD HEAT TRANSFER IN A LIGHT WATER REACTOR Ph.D. Thesis
Walter Lee Kirchner Aug. 1976 272 p refs
(Contract AT(49-24)-0230)
(PB-256481/3; NUREG-0106) Avail: NTIS HC A12/MF A01 CSCL 18I

The heat transfer processes occurring during the reflood phase of a hypcthetical loss of coolant accident are investigated. It was found that peak cladding temperature excursions are terminated by the presence of entrained liquid drops in the vertical flowing vapor stream. This dispersed flow film boiling regime is created due to a complex set of upstream thermalhydraulic conditions, hence prediction of the reflooding of a rod bundle requires a calculational method which describes the many processes occurring in the bundle during the transient. GRA

N77-12346# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
HEAT TRANSFER AND CARRYOVER OF LOW PRESSURE WATER IN A HEATED VERTICAL TUBE M.S. Thesis
Thomas Smith Aug. 1976 115 p refs
(Contract AT(49-24)-0230)
(PB-256480/5; NUREG-0105) Avail: NTIS HC A06/MF A01 CSCL 18I

Local heat transfer coefficients in the stable film boiling and dispersed flow regimes were studied for the upward flow of low pressure water in a heated vertical tube. Wall temperatures were maintained constant with time and along the tube so that both axial and time temperature gradients approached zero. Heat flux along the tube was not constant but was applied so as to maintain a steady state temperature profile. A preheater was used to bring the liquid to saturation before it entered the main portion of the test section and in some cases the equilibrium quality was greater than zero at the entrance to the main test section. GRA

N77-12347# AiResearch Mfg. Co., Phoenix, Ariz.
TRANSONIC TWO-DIMENSIONAL FLOW ANALYSIS OF COMPRESSOR CASCADE WITH SPLITTER VANES Final Technical Report, 2 Jan. - 30 Sep. 1975
P. R. Dodge Wright-Patterson AFB, Ohio AFAPL Dec. 1975 91 p refs

(Contract F33615-75-C-1004; AF Proj. 7065)
(AD-A025921; AiResearch-75-211839; AFAPL-TR-75-110)
Avail: NTIS HC A05/MF A01 CSCL 20/4

A transonic relaxation program was utilized to analyze the inviscid flow through a cascade without splitters in order to verify the results of a previous experimental investigation. The analysis showed that viscous effects play a large part in the development of the flow field in the transonic flow regime. This was demonstrated by the following: (1) inviscid flow is guided far better by the blades than the real flow, and (2) the blade surfaces are more highly loaded in the inviscid flow than in the experimentally observed viscous real flow. Following the analysis of inviscid flow through a cascade without the splitters, the program was modified to analyze the cascade flow with splitters. The results of the analysis indicated that (1) viscous effects were more pronounced with splitters present in the flow field, and (2) flow conditions (incidence and flow split) at the splitter leading edge were different from those observed experimentally. This made optimization of the splitter location through inviscid analysis a matter of questionable utility. A simplified scheme for deriving splitter passage flow areas to avoid choking was employed to develop two modified splitter configurations that were analyzed with use of the transonic relaxation program. GRA

N77-12348# Naval Postgraduate School, Monterey, Calif.
FLOW VISUALIZATION OF THE TURBULENT JET AT THE EXIT OF A SINGLE ELEMENT NOZZLE BY HOLOGRAPHIC TECHNIQUE, AND MEAN VELOCITY PROFILE MEASUREMENTS WITH A LASER DOPPLER ANEMOMETER
Ijaz Ahmad Malik Mar. 1976 73 p refs
(AD-A025439) Avail: NTIS HC A04/MF A01 CSCL 20/4

The successful application of the holographic techniques for flow visualization is reported. The investigation was conducted on the turbulent jet at the exit of a single element oscillating jet nozzle. Both single and double exposure holographic interferograms were employed to determine for an unsteady (oscillating) turbulent jet, the jet structure, spreading rates and the flapping phenomenon. The structure of the steady jet was also investigated for comparison purposes. The mean velocity profile measurements of the oscillating and non-oscillating jet were also made with the help of a laser Doppler anemometer, and results were compared with the theory and published results obtained by other methods. Author (GRA)

N77-12349# Naval Academy, Annapolis, Md. Div. of Engineering and Weapons.
THE KINETICS OF EVOLUTION OF WATER VAPOR CLUSTERS IN AIR Final Report, 1964 - 1975
A. A. Pouring Dec. 1975 140 p refs
(AD-A025675) Avail: NTIS HC A07/MF A01 CSCL 07/4

The kinetic theory of cluster formation in a condensing gas proposed by Buckle (1) attempts to calculate the course of homogeneous condensation from molecular rather than thermodynamic precepts. Here it is applied to the rapid nonequilibrium expansion of atmospheric water vapor in air. A method is established for demonstrating the validity of this theory, originally proposed for a mono-molecular gas, in the case of a complicated species such as water vapor. Cluster conditions in the temperature range 210-295 K and the vapor pressure are calculated throughout the collapse of a supersaturated metastable vapor. An effective molecular pair interaction energy and nearest neighbor coordination number is found based on the classical zero-point enthalpy of sublimation and by iteration to satisfy initial equilibrium limiting constraints at 273 K. The internal energy redistribution frequency results from close matching of the experimental pressure distribution. A method of determining the cluster size at which macroscopic properties become relevant is described; the size is found to be a cluster of about 122 molecules at 273 K based on a hard sphere model collision cross section. For the water vapor dimer an equilibrium constant of 4 x 10 to the -21st power/cc is found at 273 K compared to 3.1 x 10 to the -21st power/cc obtained from Keyes data. Two models for water vapor clusters result (from satisfying all constraints imposed on the theory) which are given in terms of number of nearest neighbors, pair interaction energy per molecule (2.9kcal/mol at 273 K) and possible structure on a cluster by cluster basis for a classical hard sphere model and for a model approximating a Pauling type clathrate. Author (GRA)

N77-12350# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
UNSTEADY TRANSONIC FLOW WITH HEAT ADDITION DUE TO CONDENSATION Final Report
Francis P. Mosnier Oct. 1975 157 p refs
(Grant AF-AFOSR-1937-70; AF Proj. 6813; AF Proj. 9711)
(AD-A025651; AFOSR-76-0437TR; SR-3) Avail: NTIS HC A08/MF A01 CSCL 20/4

This investigation is concerned with the occurrence of periodic oscillations in the compressible flow of gases through supersonic nozzles with heat addition due to condensation of vapors by homogeneous nucleation. The experimental work focuses on the influence of the ratio of the specific heats of the carrier gas, the dimensionless latent heat, and the Damkohler number on the dimensionless frequency of the fluctuating flow. The investigation is carried out in a Ludwieg tube, taking advantage of the increase of supply relative humidity with constant specific humidity over three flow periods. GRA

N77-12351# Naval Postgraduate School, Monterey, Calif.
A PROGRAM FOR THE STABILITY ANALYSIS OF PIPE POISEUILLE FLOW M.S. Thesis
Richard Howard Johnston, III Mar. 1976 75 p ref
(AD-A024927) Avail: NTIS HC A04/MF A01 CSCL 20/4

Recent research by Harrison on the stability of parallel flows resulted in a successful solution of plane Poiseuille flow but produced unexplained an malies for pipe flow. The purpose of the research in this paper was to find and correct errors in Harrison's initial analysis of the pipe flow problem. A minor error in Harrison's numerical method was corrected. Moreover, it proved necessary to reanalyze the conditions on the axis of symmetry of the pipe. These changes finally made it possible to obtain reasonable results. Owing to time limitations, the number of solutions obtained using the corrected program was sufficient only to confirm its general validity. However, the results obtained are significant in that they disclose instabilities which are known to exist but which have not been accounted for in previous theoretical investigations. Author (GRA)

N77-12352# Advisory Group for Aerospace Research and Development, Paris (France).
FLOW OF SOLID PARTICLES IN GASES
George Rudinger (State Univ. of New York, Buffalo) and A. Auriol, ed. (l'Inst. Franco-Allemand de Recherches de Saint-Louis, France) Oct. 1976 94 p refs
(AGARD-AG-222; ISBN-92-835-1228-6) Avail: NTIS HC A05/MF A01

Research on gas-particle flow in Germany, Great Britain, France, and the United States is presented. Fluidized beds and laser-Doppler anemometers were used to measure solid particles and gas flow. For individual titles, see N77-12353 through N77-12357.

N77-12353# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FRENCH CONTRIBUTION TO AERODYNAMICS OF GAS-PARTICLE MIXTURES
Paul Kuentzman *In* AGARD Flow of Solid Particles in Gases Oct. 1976 p 1-18 refs (For primary document see N77-12352 03-34)
Avail: NTIS HC A05/MF A01

Three examples, concerning the aerospace field, are presented; they concern rocket propulsion, laser anemometry and capture of droplets. A precise knowledge of the particle size distribution is essential in most cases, and improvements in optical techniques are desirable. Velocity measurements, satisfactory for small concentrations, should be extended to larger ones. Temperature measurement methods for both phases exist. Interactions between particles should be better known. Author

N77-12354# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
GAS FLOWS WITH SOLID PARTICLES: RESEARCH AND DEVELOPMENT IN GERMANY
W. Wuest *In* AGARD Flow of Solid Particles in Gases Oct.

1976 p 19-32 refs (For primary document see N77-12352 03-34)
Avail: NTIS HC A05/MF A01

Fundamental research on force and heat-transfer laws and propagation of sound and shock waves is discussed as well as more applied work on generation, conveying, separation and measurement of particles. Author

N77-12355# City Univ., London (England). Dept. of Mechanical Engineering.
A REVIEW OF RESEARCH IN THE UNITED KINGDOM IN THE FIELD OF MULTIPLE FLOWS OF SOLIDS AND GASES
R. A. Duckworth *In* AGARD Flow of Solid Particles in Gases Oct. 1976 p 33-46 refs (For primary document see N77-12352 03-34)
Avail: NTIS HC A05/MF A01

Understanding of solid-gaseous flows is much less complete than in the case of fluid flows partly because of the limitations imposed by the available measuring techniques. Several such techniques are discussed. The complex nature of gas-particle flows has led to an attempt to obtain a generalized empirical solution which is briefly described. Particle deposition, entrainment, and erosion caused by the impact of airborne particles are also discussed. Author

N77-12356# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
FLOW OF SOLID PARTICLES IN GASES: ACTIVITIES AT THE VON KARMAN INSTITUTE FOR FLUID DYNAMICS
Jean J. Ginoux and Michel Riethmuller *In* AGARD Flow of Solid Particles in Gases Oct. 1976 p 47-54 refs (For primary document see N77-12352 03-34)
Avail: NTIS HC A05/MF A01

Low speed and high speed gas-particle flow are discussed. Theoretical and experimental aspects are also discussed, as well as some work on instrumentation. In addition, observations in a fluidized bed are briefly described, and development of a laser Doppler velocimeter is outlined. Author

N77-12357# Textron Bell Aerospace Co., Buffalo, N.Y.
FUNDAMENTALS AND APPLICATIONS OF GAS-PARTICLE FLOW
George Rudinger *In* AGARD Flow of Solid Particles in Gases Oct. 1976 p 55-86 refs (For primary document see N77-12352 03-34)
(Contracts F44620-70-C-0116; N00014-67-A-0226; Proj. SQUID)
Avail: NTIS HC A05/MF A01

This survey deals with flows of a gas in which small, rigid, and permanent particles are suspended. Particle concentrations range from so low that the particles do not affect the gas flow and can be treated as single particles to so high that the particles occupy an appreciable volume fraction of the mixture. The dynamics of single particles in continuum and low-density flow, the thermodynamics of gas-particle mixtures, and the basic flow equations for one-dimensional flow are discussed. Wave propagation, nozzle flow and gas-particle jets are also discussed. Additional examples of analytical and experimental results are given to illustrate important situations. Emphasis is placed on work performed in the United States. Author

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N77-12358 Rice Univ., Houston, Tex.
CHARGE TRANSPORT AND THE PHOTOREFRACTIVE EFFECT IN DOPED AND UNDOPED LITHIUM TANTALATE Ph.D. Thesis
James Michael Spinhirne 1976 167 p
Avail: Univ. Microfilms Order No. 76-21714

Holographic techniques were used to study the photorefractive effect in lithium tantalate. Illumination of the crystal with intersecting laser beams (from an argon ion laser) and simultaneous measurements of the photocurrent and the sensitivity to volume phase hologram formation gave detailed information on the charge transport mechanism involved in the photorefractive effect. The dominant charge transport process was found to be directly linked to a bulk spontaneous photocurrent within the crystal. A reverse bias electric field was required to produce zero photocurrent. For long exposures, saturation of the change in refractive index produced by the photorefractive effect was found to be caused by the limiting effects of the associated space charge field. Effects on the holographic sensitivity and the photocurrent caused by doping with iron group impurities and oxidation-reduced treatment of LiTaO3 crystals were studied. Optical absorption measurements were used to help identify the charge states of the impurities. Dissert. Abstr.

N77-12359 Rice Univ., Houston, Tex.
THE ROLE OF CHARGE TRANSPORT IN THE FORMATION AND ERASURE OF VOLUME PHASE HOLOGRAMS IN ELECTROOPTIC LITHIUM NIOBATE Ph.D. Thesis
Dick S. L. Ang 1976 183 p
Avail: Univ. Microfilms Order No. 76-21661

A simple theory based on drift and diffusion, which describes the formation and erasure of volume phase holograms in electro-optic materials containing ionizable defects, is proposed. Experimental methods for simultaneously monitoring the formation or erasure of holograms and the photoconductivity of the sample are developed. The experimental results for LN:Mn agree with the proposed transport theory for the case in which drift dominates. The sensitivity of the material to hologram formation with no applied field can be attributed to drift as a result of an internal field. The time constant for the erasure of the hologram is inversely proportional to the photoconductivity. The sensitivity of LN:Mn can be modified by changing the relative concentrations of the two charge states of the ionizable defects and by applying an external field on the sample during writing. Dissert. Abstr.

N77-12360 National Lending Library for Science and Technology, Boston Spa (England).
A DEVICE FOR DETECTING AMPLITUDES OF VIBRATION OF TURBODYNAMO BLADES
V. S. Malyshev 30 Apr. 1975 5 p Transl. into ENGLISH of Russian Patent Appl. 1816664/18-10
(NLL-M-24095-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

A device is described for contactless measurement of the vibrations of turbodynamo wheel blades, and regulation of the signalled level of the detected amplitude. A sensing element output pulse frequency multiplier, a tube, a pulse counter, a comparison circuit, and a setter for the detected amplitude of vibration are connected in series with a single former. The comparison circuit is connected through a trigger to the signalling circuit. The output from a second former is connected to the input of the '0' setting of the second trigger, the setting input of which is connected to the output of the first pulse former, the output to the input of the tube. Author

N77-12361*# California Inst. of Tech., Pasadena. Dept. of Physics.
SUPPORT OF THE INFRARED RADIOMETER ON THE ST Final Report, 10 May 1974 - 30 Nov. 1975
G. Neugebauer and M. W. Werner 15 Jul. 1976 36 p refs (Contract NAS5-20492)
(NASA-CR-144818) Avail: NTIS HC A03/MF A01 CSCL 14B

The aim was to obtain practical experience, including observational experience, with bolometers suitable for the long wave infrared and with the filters necessary to define the spectral regions of interest. The techniques used in fabricating and testing bolometers and filters are described, and the results which were obtained to date are discussed. Author

N77-12362# Lockheed Missiles and Space Co., Palo Alto, Calif.
METHODS OF DIMINISHING THE INFLUENCE OF PERTURBING FIELDS ON MAGNETOMETRIC SENSORS
A. P. Kovalenko 1975 5 p refs Transl. into ENGLISH from the book "Magnitnye sistemy upravleniia kosmicheskimi letatelnymi apparatami' Moscow, Mashinostroenie, 1975 p 74-79
Avail: NTIS HC A02/MF A01; National Translations Center, John Crerar Library, Chicago, Illinois 60616

Methods of diminishing the influence of the fields of the magnetic actuator and other spacecraft elements on magnetometric sensors are discussed. These methods include (1) separating the sensors and the interference sources, (2) the introduction of hysteresis in the magnetic actuator control function, (3) separating the whole control time into sections when the magnetometric sensor and the magnetic actuator function, and (4) interference cancellation. D.M.L.

N77-12363*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LABORATORY CALIBRATION OF AAFE RADIOMETER/SCATTEROMETER (RADSCAT)
Lyle C. Schroeder, W. L. Jones, Jr., and John L. Mitchell (Vought Corp., Dallas) Nov. 1976 155 p refs
(NASA-TM-X-73900) Avail: NTIS HC A08/MF A01 CSCL 14B

A brief description of the electrical and mechanical instrument configuration, followed by an extensive discussion of laboratory tests and results are contained herein. This information is required to provide parameters for data reduction, and a basis for analysis of the measurement errors in data taken with this instrument. Author

N77-12364*# Aeronutronic Ford Corp., Houston, Tex.
FIELD SPECTROMETER (S191H) PREPROCESSOR TAPE QUALITY TEST PROGRAM DESIGN DOCUMENT
H. M. Campbell 28 Sep. 1976 595 p
(Contract NAS9-15014)
(NASA-CR-151110; JSC-10140) Avail: NTIS HC A25/MF A01 CSCL 14B

Program QA191H performs quality assurance tests on field spectrometer data recorded on 9-track magnetic tape. The quality testing involves the comparison of key housekeeping and data parameters with historic and predetermined tolerance limits. Samples of key parameters are processed during the calibration period and wavelength cal period, and the results are printed out and recorded on an historical file tape. Author

N77-12365*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.
ENGINEERING DESIGN CRITERIA FOR AN IMAGE INTENSIFIER/IMAGE CONVERTER CAMERA Final Report
James T. Sharpsteen, Duard L. Lund, Louis J. Stoap, and Curtis D. Solheim Oct. 1976 124 p
(Contract NAS9-14401)
(NASA-CR-151112; SPO-30348) Avail: NTIS HC A06/MF A01 CSCL 14E

The design, display, and evaluation of an image intensifier/image converter camera which can be utilized in various requirements of spaceshuttle experiments are described. An image intensifier tube was utilized in combination with two brassboards as power supply and used for evaluation of night photography in the field. Pictures were obtained showing field details which would have been undistinguishable to the naked eye or to an ordinary camera. I.M.

N77-12366# Elektronikcentralen, Hoersholm (Denmark).
HIGH EMISSIVITY COATINGS FOR IR-TEMPERATURE MEASUREMENTS
E. Sletten 2 Apr. 1976 35 p refs
(ECN-15) Avail: NTIS HC A03/MF A01

Experiments with infrared temperature measurements on thickfilm resistors and conductors coated with polyurethane varnish are described. For temperature measurements on thickfilm circuits the requirement was that the temperature variation due to variations in the emissivity was smaller than 0.5 C, which implies that the emissivity variation should be smaller than 1%. Author

N77-12367*# Michigan State Univ., East Lansing. Div. of Engineering Research.
DEVELOPMENT AND APPLICATION OF AN INTERFEROMETRIC SYSTEM FOR MEASURING CRACK DISPLACEMENTS Final Report, 1 Mar. 1975 - 30 Jun. 1976
W. N. Sharpe, Jr. 1976 72 p refs
(Grant NsG-1148)
(NASA-CR-145106) Avail: NTIS HC A04/MF A01 CSCL 14B

The development of the first version of a minicomputer controlled system that converts the fringe pattern motion into a voltage output proportional to displacement is presented. Details of the instrument and the calibration tests are included. Author

N77-12368*# Martin Marietta Corp., Denver, Colo.
ANALYSIS OF SKYLAB FOLLOW-ON ORBITAL NEUTRON ENVIRONMENTAL DATA Final Report
Nov. 1976 14 p refs
(Contract NAS8-32014)
(NASA-CR-150109; MCR-76-559) Avail: NTIS HC A02/MF A01 CSCL 14B

The data base and techniques developed for Skylab experiment ED76 were used to process and analyze data from 54 solid dielectric track recorders. The processing of mica and cellulose nitrate for neutron and proton detectors is described. The measured time integrated fission rates for seven detectors is given. Author

N77-12369# Southampton Univ. (England). Inst. of Sound and Vibration Research.
A STUDY OF SERVO ACCELEROMETER DESIGN FOR LOW FREQUENCY VIBRATION MEASUREMENT
R. G. White and K. J. Worrall Sep. 1975 54 p refs
(ISVR-TR-85) Avail: NTIS HC A04/MF A01

The relevance of mechanical and electrical parameters in servoaccelerometer design was studied; the development of a capacitive displacement transducer for use in a servo accelerometer is described. Results from an experimental accelerometer are given and the linearity of the device demonstrated. Author (ESA)

N77-12370# Admiralty Materials Lab., Poole (England).
SPECTRAL SENSITIVITY CALIBRATION OF SPECTROPHOTOMETERS
C. A. Parker and C. G. Hatchard Mar. 197[illegible] 11 p refs
(AML-R7602; BR51963) Avail: NTIS HC A02/MF A01; HMSO; PHI

A standard lamp calibrated by NPL was used to measure the spectral sensitivity curve of a spectrophotometer which had previously been calibrated in the ultraviolet region against the ferrioxalate actinometer. The results indicated that the calibration of the lamp can be extrapolated appreciably below 300 mm with sufficient accuracy for many purposes. The spectral sensitivity curve of a previously uncalibrated double grating spectrophotometer was measured by this technique. Author (ESA)

N77-12371# Materials Research and Development, Inc., Rockville, Md.
PHOTOGRAPHIC PLATES FOR EMISSION SPECTROGRAPHIC ANALYSIS
R. A. Mostyn and C. Heathcote Aug. 1975 24 p refs
(MQAD-R-234; BR52816) Avail: NTIS HC A02/MF A01

The emulsion characteristics of 12 different photographic plates used in spectrographic analysis were compared. Six of these, manufactured by either Eastman Kodak Co., or Agfa-Gaevert Ltd., represent possible replacements for the other six, manufactured by Ilford Ltd., as these are scheduled for withdrawal from the market by late 1975. Results are presented for contrast, speed, and spectral response comparisons. Recommendations on replacement of the Ilford plates in standard laboratory methods are given and the future work program is discussed. Author (ESA)

N77-12372# Philips Labs., Briarcliff Manor, New York.
DEVELOPMENT OF AN OPTICAL DISC RECORDER Quarterly Technical Report, 1 Jan. - 31 Mar. 1976
George Kenney, C. Balas, D. Lou, A. Chan, T. Demetrakopoulos, R. McFarlane, and J. Wagner May 1976 39 p ref
(Contract N00014-76-C-0441; ARPA Order 3080)
(AD-A025291; PL-21-VR76-0507) Avail: NTIS

HC A03/MF A01 CSCL 14/5

A program schedule with milestones is given for the materials development and recorder construction for an optical disc recorder. This schedule will be used, updated where necessary, on all subsequent reports. The recorder components were fabricated, and the recorder is being assembled. Laser machining of bismuth and selenium films produced at PL indicates acceptable sensitivity and hole geometries. The air sandwich appears to be the most attractive protective mechanism for the disc and has been chosen as the prime candidate for extensive testing and analysis. A task force was set up to study digital coding problems. GRA

N77-12373# C and C Research, Inc., Danvers, Mass.
CPA COLOR REVERSAL STUDY Final Technical Report, Dec. 1974 - Nov. 1975
M. R. Cole and Raoul A. Daunais May 1976 52 p refs
(Contract F30602-75-C-0074; AF Proj. 5534)
(AD-A025899; RADC-TR-76-151) Avail: NTIS
HC A04/MF A01 CSCL 14/5

The Concurrent Photon Amplification (CPA) speed enhancement technique for low light level photography has been successfully adapted for use with three (3) Kodak color reversal films i.e., High Speed Ektachrome, Ektachrome-X and 2483. The speed gains achieved range from ten times for transparencies with good color saturation and resolution to more than 100 times with some loss of saturation and maximum resolution. Initial experiments concentrated on using the above transparency films alone using normal processing procedures. Subsequent experiments using negative color processing and several duplication phases were conducted in order to increase the color saturation of the CPA enhanced imagery. The required CPA lamps combination for the color reversal films was the same white blue and green combination as determined under a previous effort for color negative films. These lamps were installed in a Nikon F-2 camera. A battery pack/power supply was also provided to power and control the individual lamps. GRA

N77-12374# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
PHOTOGRAPHIC EMULSION THRESHOLD FUNCTIONS STUDY Final Report, Jul. 1972 - Jan. 1975
Cristobol Rodriguez-Torres and Roger B. Summers Mar. 1976 128 p refs
(AF Proj. 7646; AF Proj. 2004)
(AD-A025471; AFAL-TR-76-19) Avail: NTIS
HC A07/MF A01 CSCL 14/5

The main objective of this effort was to establish an in-house capability to generate threshold functions for photographic B and W films. A secondary objective was to investigate the effect of the microcamera numerical aperture, light source spectral distribution, and the microcamera transfer function type on the MTF x AIM intercept. An experiment was run to generate threshold data for four primary photographic emulsions (2402, 2403, 3400, and 3414) and two secondary photographic emulsions (FE3215 and 3404) under three numerical apertures (0.16, 0.30, and 0.65), two spectral distributions (550 nm and daylight), and three transfer function types (MTF, square wave response, and tri-bar response). The optimum, 95 confidence limits, and + or - one stop threshold function were crossed with four typical lenses MTF. The resulting intercepts were statistically analyzed for significance in the data. The experiment showed that the threshold functions are insensitive to changes in NA, spectral distribution, and transfer function type for the conditions tested and within the experimental error. Most important, an in-house capability was established to generate threshold functions under a wide range of conditions. GRA

N77-12375# DARCOM Intern Training Center, Texarkana, Tex.
PRELIMINARY EVALUATION OF FATIGUE LIFE GAGES USED FOR BEAM LIFE PREDICTION Final Report
Teddie V. Stokes Apr. 1976 58 p refs
(AD-A024811; DARCOM-ITC-02-08-76-105) Avail: NTIS
HC A04/MF A01 CSCL 14/2

The present state of the art in material failure in structures has introduced the fatigue life gage. This sensor, an integrating fatigue damage device, monitors the cumulative fatigue damage of an element of structure to which it is bonded. The main objectives of this preliminary study were to initiate the investigation of these sensors and evaluate equipment needed. The report contains some characteristics of the sensors not discussed in the applications note from the manufacturer and instrumentation difficulties in use in the field. Conclusions drawn from the study are as follows: (1) The fatigue life gages suffer instrumentation difficulties at small strain levels; and, (2) The study should be extended at high strain levels and at longer specimen life. GRA

N77-12376# National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
AN ANALYTICAL AND EXPERIMENTAL DETERMINATION OF THE CUTOFF FREQUENCIES OF HIGHER-ORDER TE MODES IN A TEM CELL
John C. Tippet, David C. Chang, and Myron L. Crawford Jun. 1976 29 p refs Sponsored in part by AF
(PB-256319/5; NBSIR-76-841) Avail: NTIS
HC A03/MF A01 CSCL 14B

In addition to the TEM mode, higher order TE and TM modes can propagate in a TEM cell. Since only the TEM mode is desired, the higher-order modes restrict the useful frequency range of the TEM cell. The cutoff frequency of the first higher-order mode is obtained both analytically and experimentally for several TEM cells of differing geometry. The difference between the experimental and theoretical results is shown to be only a few percent. In addition the field distribution of the first higher-order mode is found explicitly. GRA

N77-12377# Transportation Research Board, Washington, D.C.
INSTRUMENTATION AND EQUIPMENT FOR TESTING HIGHWAY MATERIALS, PRODUCTS, AND PERFORMANCE Final Report
Jun. 1976 85 p refs Sponsored by Am. Assoc. of State Highway and Transportation and the Fed. Highway Admin.
(PB-256138/9; TRB/NCHRP/SYN-36; ISBN-0-309-02507-9)
Avail: NTIS HC A05/MF A01 CSCL 13C

State transportation agencies were contacted and requested to submit information on new or recently added equipment and/or new uses for old or new equipment for laboratory or field testing for quality assurance and control of highway materials. Information was received from 44 agencies. The information received from the transportation agencies is separated into two categories, equipment primarily for laboratory tests and that primarily for field tests. Each category is subdivided into groups by specific equipment or type of test. The data include 312 laboratory items and 152 field items. Costs of individual items of equipment range from $10 to $340,000. Findings are presented in the form of tables containing user agencies' experiences and viewpoints on each item. GRA

N77-12378# National Oceanographic Instrumentation Center, Washington, D.C.
DISSOLVED OXYGEN METER, MODEL 57 (YELLOW SPRINGS INSTRUMENT CO., INC., OHIO) Instrument Fact Sheet
Mar. 1976 13 p
(PB-256754/3; IFS-76007; NOAA-S/T-76-2045;
NOAA-76033103) Avail: NTIS HC A02/MF A01 CSCL 08J

The dissolved oxygen meter measures dissolved oxygen and temperature in situ in fresh and salt water. Dissolved oxygen is sensed with a gold-silver polarographic membrane type probe that is designed to be automatically temperature compensated. Compensation for salinity may be achieved by manual adjustment of a dial on the face of the readout unit. Temperature is sensed by a thermistor. Data are provided in the form of a visual display on an analog panel meter and through analog recorder outputs. The model is powered by C size, carbon zinc batteries. An optional stirrer powered by a separate set of five rechargeable nickel cadmium batteries is also available. GRA

N77-12379# DARCOM Intern Training Center, Texarkana, Tex.
HOLOGRAPHIC INTERFEROMETER BACKGROUND FRINGE REDUCTION BY DUAL VACUUM APPLICATION Final Report
Daniel A. McElwee May 1976 47 p refs
(AD-A024741; DARCOM-ITC-02-08-76-023) Avail: NTIS
HC A03/MF A01 CSCL 20/6

This report evaluates performance capabilities of a modified holographic nondestructive testing system. Specifically, the

problem considered is that of reducing the obscuring background contour pattern which occurs when a vacuum stress is applied to honeycomb shelter panels undergoing holographic inspection for subsurface defects. Rather than optically masking the interference fringes, application of a compensating vacuum is investigated. The report also examines optimal photographic exposure and development times to obtain clearest test results with the holographic interferometer. Author (GRA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N77-12380 Princeton Univ., N.J.
A SEARCH FOR CHEMICAL LASER ACTION IN LOW PRESSURE METAL VAPOR FLAMES Ph.D. Thesis
Melvin Leslie Zwillenberg 1975 395 p
Avail: Univ. Microfilms Order No. 76-22611

Reactions of the alkaline earth metals with various oxidizers are prime candidates for potential electronic transition chemical laser application, because of their high exothermicity, the availability of numerous low-lying electronically excited states and the observation in these reactions of visible chemiluminescence. A study has been made of optical emissions from low pressure dilute diffusion flames of Ca and Mg vapor with O2, N2O and mixtures of CCl4 and O2. The Ca flames with O2 and N2O revealed high vibrational excitation of the product CaO molecule. The flames with CCl4 revealed extreme non-equilibrium metal atom electronic excitation, up to the metal atom ionization limit. The metal atom excited electronic state populations did not follow a Boltzman distribution, but the excitation rates were found to obey an Arrhenius-type expression. Dissert. Abstr.

N77-12381 Indiana Univ., Bloomington.
STUDIES INTO TUNABLE-LASER-EXCITED ATOMIC FLUORESCENCE SPECTROMETRY Ph.D. Thesis
Dorys Rojas DeOlivares 1976 248 p
Avail: Univ. Microfilms Order No. 76-21547

The immunity of saturated-level AFS to quenching was investigated by measuring the fluorescence signal under saturated conditions for a number of atomic transitions in quenching and non quenching environments. From these investigations, it appears that the overall fluorescence lifetimes are affected by the atom's environment, although the magnitude of the spontaneous fluorescence signal remains the same. Measurement of these changes in lifetimes yields information about the kinetics of collisional quenching processes. The magnitude of radiant power density required to produce saturation of several resonance and nonresonance atomic transitions was experimentally determined under different atom environmental conditions, and these measurements suggest that the saturation power density is just a property of the particular transition studied but independent of the atomizer used. Dissert. Abstr.

N77-12382 Johns Hopkins Univ., Baltimore, Md.
FAR-INFRARED, CHEMICAL WATER LASERS Ph.D. Thesis
Gale Deborah Downey 1975 100 p
Avail: Univ. Microfilms Order No. 76-22963

Two chemical, far-infrared water lasers were produced by flash photolysis in a laser cavity of (1) a hydrogen and ozone mixture and (2) an oxygen, water and ozone mixture. The pulsed, laser emissions were studied as a function of mixture composition, total pressure, and flash energy. Chemical mechanisms that account for all the experimental observations were formulated and confirmed by calculations that reproduced the observed time dependent characteristics of these laser pulses. Hydrogen and ozone mixtures, when photolyzed, produced strong, simultaneous emission. Dissert. Abstr.

N77-12383 Syracuse Univ., N.Y.
ELASTIC AND QUASI-ELASTIC LASER LIGHT SCATTERING OF PHOTOCHROMIC MACROMOLECULES Ph.D. Thesis
Thomas Robert Tice 1975 261 p
Avail: Univ. Microfilms Order No. 76-18568

The transduction processes of biological photoreceptors appear to involve light-induced conformational transitions of membrane-bound proteins. In order to elucidate various physicochemical pathways by which these processes can be triggered, model studies were undertaken employing photochromic moieties bound to synthetic macromolecules with a labile fold structure. Attention was focused on three aqueous systems: (1) the anionic dis-azo stilbene dye chrysophenine (CHP) and poly(methacrylic acid) (PMA), (2) the cationic dye p-phenyl-azophenyl trimethyl ammonium iodide (PTA) and PMA, and (3) the neutral dye p-phenyl azomethacrylanilid (PM) copolymerized with methacrylic acid (MA). The experimental techniques applied to the model studies included elastic and quasi-elastic laser light scattering, viscosity, and spectrophotometric methods. Dissert. Abstr.

N77-12384 California Inst. of Tech., Pasadena.
GALLIUM ARSENIDE - GALLIUM ALLUMINUM ARSENIDE DISTRIBUTED FEEDBACK AND DISTRIBUTED BRAGG REFLECTOR LASERS Ph.D. Thesis
Huan-wun Yen 1976 187 p
Avail: Univ. Microfilms Order No. 76-23120

Theoretical and experimental studies of GaAs-GaAlAs distributed feedback and distributed Bragg reflector lasers are described. A coupled-mode formalism was used to study the propagation of electromagnetic waves in a dielectric waveguide with periodic surface corrugation. The reflection and transmission characteristics of both passive and active periodic waveguides were found as a function of wavelength. These results were then used to derive the oscillation conditions of the lasers under study. The procedure of determining the lasing wavelength is outlined. The merits and disadvantages of various laser structures are compared and discussed. Experimental results on fabrication and measurements of GaAs-GaAlAs distributed feedback and distributed Bragg reflector lasers are presented and compared with the theory. Various fabrication and measurement techniques are described. Dissert. Abstr.

N77-12385# Frankford Arsenal, Philadelphia, Pa.
LASER INTERFEROMETER TECHNIQUES FOR INSPECTION OF OPTICAL COMPONENTS
Stanley P. Kopacz Sep. 1975 13 p
(AD-A025088; FA-TR-75070) Avail: NTIS HC A02/MF A01 CSCL 20/6

A method employing laser interferometry was used for detecting inhomogeneities of refraction index in optical glass prior to use in optical fabrication. A Twyman-Green interferometer configuration using a laser source was constructed. System errors were removed by a Moire technique. Samples of A, B, C and D glass were introduced into one of the beams and the resultant fringe patterns analyzed to obtain the magnitude of the index of refraction variations. Author (GRA)

N77-12386# Army Electronics Command, Fort Monmouth, N.J.
THE SPECTRAL CHARACTERISTICS AND ATMOSPHERIC CO2 ABSORPTION OF THE Ho(+)3: YLF LASER AT 2.05 MICROMETERS
Pattie S. Gillespie (New Mexico State Univ., Las Cruces), R. L. Armstrong (New Mexico State Univ., Las Cruces), and Kenneth O. White Dec. 1975 48 p refs
(DA Proj. 1T1-61102-B-53A)
(AD-A025618; ECOM-5583) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report presents the procedures used to obtain the spectral profile of the holmium:YLF laser and to calculate the absorption and self-broadening coefficients of CO2 from atmospheric transmittance data taken with this laser. Three laser wavelength regions are observed, one of which is resolved into a previously undetected doublet. The coincidence of the holmium laser radiation with the (4nu2 - nu3) combination band of CO2 is determined to be principally with the R30 absorption line. Several partial pressures of CO2 from 0.5 to 10 torr are used, buffered with N2 to a total pressure of 760 torr. The line center absorption coefficient at atmospheric concentrations of CO2 (0.25 torr) determined from this work is 0.52 + or - 0.07 per km. An average value of the self-broadening coefficient is determined to be 0.44. This information will be used in the evaluation of the holmium laser for field army applications. Author (GRA)

N77-12387# Informatics, Inc., Rockville, Md.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 22, OCTOBER - DECEMBER 1975
Stuart G. Hibben and Carl Minkus 17 May 1976 166 p
(Contract MDA903-76-C-0254; DARPA Order 3097)
(AD-A025913) Avail: NTIS HC A08/MF A01 CSCL 20/5

This is the Soviet Laser Bibliography for the fourth quarter of 1975 and is No. 22 in the series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; computer technology; holography; laser-induced chemical reactions; instrumentation and measurements; beam-target interaction; and plasma generation and diagnostics.
Author (GRA)

N77-12388# Frankford Arsenal, Philadelphia, Pa.
REFLECTIVE DIELECTRIC COATINGS AS LASER COUNTERMEASURES
James W. DeVocht Oct. 1975 30 p refs
(DA Proj. 1T1-61102-A-31C)
(AD-A024762; FA-TR-75075) HC A03/MF A01 CSCL 17/4

Two dielectric reflectors were evaluated. The computer model predictions of the transmission spectra for these reflectors closely reproduced the experimental optical density vs wave-length data for both planes of polarization and for various angles of incidence. The dielectric film designed for use at 1060nm vs neodymium lasers affords good protection against laser radiation up to 70 MW/sq cm with luminous transmittance above 90% in the visible region. Optical densities were also measured as a function of angles of incidence of the laser beam on this film. The optical density decreased from about 4.0 to about 3.5 as the angle of incidence increased from normal to about 30 deg. A second reflector was designed to reject both 1060nm and 530nm radiation. This filter exhibited an OD of 2.0 at both 1060 and 530nm. The optical density remained approximately constant for angular deviations to about 40 deg from the normal at power densities up to 65 MW/sq cm, however, the luminous transmittance was only about 7%. Both of these dielectric devices showed good resistance to damage by high power density Q-switched Nd and 2xNd pulses. Author (GRA)

N77-12389# Oregon Graduate Center for Study and Research, Beaverton.
PROPAGATION OF MULTIWAVELENGTH LASER RADIATION THROUGH ATMOSPHERIC TURBULENCE Interim Technical Report, 1 Aug. 1975 - 31 Jan. 1976
J. Richard Kerr, J. Fred Holmes, Myung Lee, and Philip A. Pincus Apr. 1976 73 p refs
(Contract F30602-74-C-0082; ARPA Order 1279)
(AD-A024863; RADC-TR-76-111) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report reviews initial progress on a new program of investigation of scintillation and coherence effects for a laser-illuminated, noncooperative target as viewed through atmospheric turbulence. The application of the effort is in the prediction of turbulence effects on the operation of coherent optical adaptive transmitter (COAT) systems. Significant analytical progress is reviewed, including results for the mutual coherence function, variance and covariance of irradiance, spectra, and statistics for a coherently illuminated diffuse target. It is found that there are three pertinent covariance scales and six possible parameter realms, and that the normalized variance will be unity except in those cases when the target spot is sufficiently small as to constitute a quasi-point-source. The analysis is partially extended to a more complex target and to the incoherent case, and future analytical tasks and applications to real adaptive systems are outlined. The establishment of an experimental field facility is also described, which will be capable of measuring all pertinent quantities at both visible and middle-infrared wavelengths. GRA

N77-12390# Rockwell International Corp., Anaheim, Calif. Autonetics Group.
RING LASER ATTITUDE SYSTEM Final Report, 30 Apr. 1973 - 12 Nov. 1974
F. Vescial and Philip L. Anthony Feb. 1976 76 p refs
(Contract F33615-73-C-1127; AF Proj. 6095)
(AD-A025769; AFAL-TR-75-194) Avail: NTIS HC A05/MF A01 CSCL 17/7

The objective of effort carried out on this program was to fabricate a two-axis Ring Laser Gyro Attitude System complete with electronics which would be usable as instrumentation on a 100 g rocket sled. GRA

N77-12391# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
TRACKER BACKSCATTER STUDY Final Report, 3 Nov. 1975 - 31 May 1976
R. G. Otto, G. Gal, M. W. Munn, W. Wells, and A. D. Wood May 1976 86 p refs
(Contract N60921-76-C-0073)
(AD-A025768; LMSC-D502868) Avail: NTIS HC A05/MF A01 CSCL 17/5

An experimental and analytical investigation of laser aerosol backscatter as it may affect hot-spot tracking was performed. Scattering measurements (forward and 177 degrees backscatter) were made with an infrared radiometer and the TRW Baseline Demonstration Laser at the Capistrano test site in Southern California as part of the JAN propagation test Series A and B. Twenty-two tests of backscatter were conducted at low power (800W) and high power (40kW) with three spectral filters in the radiometer. Mie scattering calculations were made to predict the scattering coefficient and compare it with the measured value. Meteorological data were provided by the JAN propagation council and included temperature, relative humidity, wind velocity, total extinction, and aerosol data. Extrapolations of the verified models to higher laser powers, on-axis tracking through an annular beam, and to maritime aerosols were made. GRA

N77-12392# GTE Sylvania, Inc., Mountain View, Calif. Electro-Optics Organization.
LITHIUM IODATE PARAMETRIC OSCILLATOR Final Report, Nov. 1973 - May 1975
Eugene O. Ammann Wright-Patterson AFB, Ohio AFAL Apr. 1976 77 p refs
(Contracts F33615-74-C-1014; AF Proj. 2001)
(AD-A025758; AFAL-TR-75-14) Avail: NTIS HC A05/MF A01 CSCL 20/6

This report summarizes the results of a fifteen-month program whose goal is to study the potential of lithium iodate as an infrared optical parametric oscillator (OPO) material. Since lithium iodate is transparent further into the infrared than lithium niobate, a major goal of this program has been to push kHz-pulse-repetition-rate OPO outputs beyond the 3.7 micrometers previously obtained using lithium niobate. Parametric oscillation was successfully achieved in lithium iodate on this program with average output powers of 530 mW obtained in the 1.9 to 2.4 micrometer range, 50 mW in the 3.2 to 3.8 micrometer range, 5 mW in the 3.8 to 4.1 micrometer range, and up to 1 mW obtained in the 4.4 to 5.1 micrometer range. Rotation tuning was used to tune the LiIO3 and LiNbO3 OPO performance. In addition, OPO threshold expressions were derived that separate the effects of crystal idler absorption, signal absorption, and OPO mirror reflectivities. GRA

N77-12393# McDonnell-Douglas Research Labs., St. Louis, Mo.
CO CHAIN-REACTION CHEMICAL LASER RESEARCH Final Report
William Q. Jeffers, Harris Y. Ageno, and Charles E. Wiswall Apr. 1976 20 p refs
(Contract F29601-74-C-0119; AF Proj. 1256)
(AD-A024719; MDC-10158-01; AFWL-TR-75-277) Avail: NTIS HC A02/MF A01 CSCL 20/5

A chain-reaction CO chemical laser fueled by carbon monosulfide (CS) and molecular oxygen (O2) has been demonstrated. Initiation by the chain carriers (either O-atoms or S-atoms) is necessary; the chain length lambda* increases rapidly with CS/CS2 fuel mole ratio reaching a value lambda* approximately equal to 9.5 at CS/CS2 = 1.57. Mass flow efficiencies up to 67 kJ/lb sub m have been measured with a small-scale subsonic device, and laser operation has been observed up to 64 Torr cavity pressure. Gain measurements, mixing effects, and computer modeling of this system have been investigated. This work was

made possible by the development of a thermoelectric CS gas generator, which is also described. GRA

N77-12394# Naval Postgraduate School, Monterey, Calif.
A STUDY OF BOUNDARY LAYER AND MASS BLEED IN A SHORT LENGTH SUPERSONIC DIFFUSER FOR A GAS DYNAMIC LASER M.S. Thesis
Paul Grimmer Habel Mar. 1976 116 p refs
(AD-A025673) Avail: NTIS HC A06/MF A01 CSCL 20/5

This research was conducted to study the effect of boundary layer and mass bleed on the starting (i.e., establishment of supersonic flow) and running of a short length supersonic diffuser for a gas dynamic laser. A one-dimensional diffuser geometry which diffused the flow by an isentropic turn was laid out by the method of characteristics. Extensive boundary layer bleed holes and slots were incorporated in the diffuser walls. Self-actuating, one-way valves installed in the walls bled excess flow during starting. Schlieren flow visualization was obtained through opposite glass diffuser walls. The diffuser was started and Mach 3.5 flow established in a diffuser with a contraction ratio of 1.69. This geometry would not start without utilizing boundary layer and mass bleed. A mode of operation called self bleed was discovered. The lower static pressure in the diffuser entrance, via suitable ducting, was used to bleed the boundary layer in the diffuser throat. This method reduced the minimum operating stagnation pressure 17.0% without utilizing vacuum tanks or pumps. Testing confirmed that boundary layer bleed in the diffuser throat significantly lowers operating stagnation pressure.
Author (GRA)

N77-12395# Rockwell International Corp., Anaheim, Calif. Electronics Group.
COHERENT OPTICAL ADAPTIVE TECHNIQUES (COAT) Quarterly Technical Report, 16 Jul. - 16 Oct. 1972
C. L. Hayes 16 Oct. 1972 45 p
(Contract F30602-72-C-0417; ARPA Order 1279)
(AD-A025669; C72-731.2/501; RADC-TR-72-341) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report summarizes the design specifications and operating properties of the individual components employed in a 6 element linear COAT experimental array. This array employs a phase conjugate principal to adaptively compensate for both receive and transmitting wavefront aberrations induced by the atmosphere, the target and/or the optical system itself. Inherent in the adaptive operations of the COAT array is its ability to select, focus to and track a single glint in a multiglint moving target environment. The report includes test results for the frequency modulator, detector, laser and electronics subsystems. The key element, frequency modulator, has been thoroughly tested with performance meeting theoretically defined specifications. PbSnTe detectors are now being used for heterodyne receivers and have replaced GeCu devices with their attendant requirement for liquid helium. Initial system test results are given along with a system modification which has been made. Performance is close to predicted values and signal-to-noise evaluation for the 1 km range indicates that plenty of margin for operation at a range of 10 km is present.
GRA

N77-12396# Hughes Research Labs., Malibu, Calif.
STUDY OF SURFACE FINISHING AND COATING OF DF LASER WINDOWS Annual Technical Report, 1 Apr. 1975 - 31 Mar. 1976
A. I. Braunstein, B. Garcia, and J. E. Rudisill May 1976 21 p
(Contract N00014-75-C-0891)
(AD-A025710) Avail: NTIS HC A02/MF A01 CSCL 20/6

Work was done in surface finishing to provide optimum surfaces for film adhesion and to eliminate damage and contaminants which contribute to absorption, reduce laser damage thresholds, and reduce environmental stability. Attention was focused on techniques to fabricate flat and parallel windows, with the ultimate goal of scale-up to satisfy operational needs. Emphasis was placed on SrF2 and CaF2 windows since these are the current best candidates for the DF laser band. The properties of coating materials were studied to develop a catalog of usable materials. Particular attention was paid to refractive indices which are necessary for the design of antireflective coatings that have low reflectance over the entire DF laser band. The results of this survey provide the only firm data to date on the absorption of prospective coating materials in the DF laser band. GRA

N77-12397# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PARAMETRIC ANALYSIS OF LASER TARGET DESIGNATORS FOR AIRBORNE APPLICATIONS M.S. Thesis.
Barry L. Hardin Dec. 1975 102 p refs
(AD-A025659; GEP/PH/75D-17) Avail: NTIS HC A06/MF A01 CSCL 20/6

Laser target designator performance criteria are established from past Pave Way program - related mission analyses. With these criteria as performance standards, parametric design studies are performed in four areas of investigation - laser resonators, flashlamps, coolant systems, and Q-switches. These parametric studies are combined with other design factors and a complete laser target designator integration is postulated. After describing methods for designing a laser resonator with beam divergence being the motivating factor, the report substantiates best choices of flashlamps, coolant systems, and Q-switches. These choices are as follows: flashlamp krypton for less than 10 J/p and xenon for greater than 10 J/p; coolant system - liquid to air heat exchanger using ethylene glycol/distilled water; and Q-switch LiNbO3. These approaches along with other design factors are summarized and integrated into one optimum design taking into account cost-effectiveness, reliability, maintainability, and producibility. GRA

N77-12398# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INVESTIGATION OF THE DEGRADATION OF A LASER BEAM BY HIGH INTENSITY TURBULENCE Ph.D. Thesis
George F. Cudahy 26 May 1976 179 p refs
(AD-A025658; DS/AE/76-1) Avail: NTIS HC A09/MF A01 CSCL 20/6

The intensity reduction of the far field central spot formed by a collimated laser beam traversing intense turbulence was correlated with the statistical behavior of the refractive index perturbations causing the intensity reduction. An analytical method to predict the intensity degradation using readily measurable statistical turbulence parameters was developed. An experiment to measure the actual far field central spot intensity reduction and the temperature and velocity perturbations causing that reduction was conducted. A one by ten centimeter nozzle with laminar, uniform velocity/temperature profile exhaust air created the turbulence. A He-Ne laser with 50.0, 26.8 and 11.0 mm diameter beams and a He-Cd laser with 50.0, 26.0 and 12.3 mm diameter beams were used. The actual far field central spot intensities were measured. The average difference between the experimentally and analytically determined far field degraded intensities was less than two percent. GRA

N77-12399# Avco-Everett Research Lab., Everett, Mass.
INVESTIGATION OF ELECTRON IMPACT PROCESSES RELEVANT TO VISIBLE LASERS Semiannual Report, 1 Sep. 1975 - 29 Feb. 1976
John W. Boness Apr. 1976 21 p refs
(Contract N00014-75-C-0064; ARPA Order 1806)
(AD-A025005) Avail: NTIS HC A02/MF A01 CSCL 20/5

The program objective is to obtain electron impact cross sections relevant to visible lasers of current interest. These measurements include excitation of the upper and lower laser levels from the ground state and also excitation from metastable laser levels in order to determine mixing cross sections between the lasing levels. GRA

N77-12400# Avco-Everett Research Lab., Everett, Mass.
METAL VAPOR VISIBLE LASER KINETICS PROGRAM Semiannual Technical Report, Sep. 1975 - Feb. 1976
D. Trainor Apr. 1976 26 p refs
(Contract N00014-75-C-0061; ARPA Order 1806)
(AD-A025004) Avail: NTIS HC A03/MF A01 CSCL 20/5

The objective of this program is to investigate experimentally and theoretically the important kinetic rate processes pertinent to the development of a high power visible laser. This research consists of three tasks. GRA

N77-12401# McDonnell Aircraft Co., St. Louis, Mo.
DIGITAL PROCESSING AND ANALYSIS OF ACTIVE MULTISPECTRAL DATA
Gary J. Wilhelmi and Charles R. Fulkerson Griffiss AFB, N. Y. RADC Apr. 1976 64 p refs
(Contract F30602-75-C-0293; AF Proj. 6244)
(AD-A025009; RADC-TR-76-99) Avail: NTIS HC A04/MF A01 CSCL 17/8

Seven runs of active multispectral data from a scanning laser sensor were digitized and analyzed to examine the classification capability of the difference figure of merit (DFOM) algorithm and to examine the effects of sensor bandwidth and scan speed, atmospheric transmission and polarization on the classification rate. The data represented the magnitudes of the scattering cross sections from a calibrated resolution target, comprising panels of many colors, sizes, and orientations. Co-polarized and cross polarized components of the back scattered radiation were measured at four frequencies in the visible spectrum. A multispectral signature vector was derived for each sample of the digitized data. The DFOM analysis compares the direction of the unknown multispectral signature vector with standard signature vectors measured in the laboratory. Classification occurs when a directional match is found. Using a priori knowledge of target configurations, the probability of correct classification was found to be high for most target materials. Discrimination capability decreases for similar colors and small scattering cross sections. Increasing bandwidth allows greater distinction between similar signatures but does not improve discrimination between dissimilar signatures. Co-polarized data could not be classified with the DFOM technique. Results of the scan speed and atmospheric transmission studies were inconclusive. Author (GRA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N77-12402* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MECHANICAL THERMAL MOTOR Patent
Leopold A. Hein and William N. Myers, inventors (to NASA) Issued 26 Oct. 1976 8 p Filed 30 Jun. 1975 Supersedes N75-27561 (13 - 18, p 2276)
(NASA-Case-MFS-23062-1; US-Patent-3,987,630; US-Patent-Appl-SN-591569; US-Patent-Class-60-527) Avail: US Patent Office CSCL 13I

An apparatus is described for converting thermal energy such as solar energy into mechanical motion for driving fluid pumps and similar equipment. The thermal motor comprises an inner concentric cylinder carried by a stationary core member. The core member has a cylindrical disc plate fixed adjacent to a lower portion and extending radially from it. An outer concentric cylinder rotatably carried on the disc plate defining a space between the inner and outer concentric cylinders. A spiral tubular member encircles the inner concentric cylinder and is contained within the space between the inner and outer cylinders. One portion is connected to the inner concentric cylinder and a second portion connected to the outer concentric cylinder. A heated fluid is conveyed through the tubular member and is periodically cooled causing the tubular member to expand and contract. This causes the outer concentric cylinder to reciprocally rotate on the base plate accordingly. The reciprocating motion of the outer concentric cylinder is then utilized to drive a pump member in a pump chamber. Official Gazette of the U.S. Patent Office

N77-12403*# Case Western Reserve Univ., Cleveland, Ohio. Mechanical Design Dept.
ROLLER BEARING GEOMETRY DESIGN Final Report
Michael Savage and Bruce H. W. Pinkston 5 Oct. 1976 113 p refs
(Grant NsG-3077)
(NASA-CR-135082) Avail: NTIS HC A06/MF A01 CSCL 13I

A theory of kinematic stabilization of rolling cylinders is extended and applied to the design of cylindrical roller bearings. The kinematic stabilization mechanism puts a reverse skew into the rolling elements by changing the roller taper. Twelve basic bearing modification designs are identified amd modeled. Four have single transverse convex curvature in their rollers while eight have rollers which have compound transverse curvature made up of a central cylindrical band surrounded by symmetric bands with slope and transverse curvature. The bearing designs are modeled for restoring torque per unit axial displacement, contact stress capacity, and contact area including dynamic loading, misalignment sensitivity and roller proportion. Design programs are available which size the single transverse curvature roller designs for a series of roller slopes and load separations and which design the compound roller bearings for a series of slopes and transverse radii of curvature. The compound rollers are proportioned to have equal contact stresses and minimum size. Design examples are also given. Author

N77-12404# Lockheed Missiles and Space Co., Palo Alto, Calif.
MECHANICAL DAMPING OF FLYWHEEL STABILIZATION SYSTEMS
A. A. Sochivko, V. P. Kirsanov, V. I. Dranovskii, and A. P. Alpatov 1975 7 p refs Transl. into ENGLISH from Kosm. Issled. na Ukraine (USSR), no. 5, 1975 p 80-86
Avail: NTIS HC A02/MF A01; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The flywheel in known flywheel angular stabilization systems is rigidly coupled to the shaft of the actuator motor. The difficulties in damping such systems in the case of failure to use the gyroscopic angular velocity sensors consist of the need to realize significant time constants of the correcting units because of the low frequencies of the system. It is proposed to use a flywheel actuator which possesses the properties of energy dissipation of the vibrational motion and is one of the modifications of an inertial damper. The method of selecting the parameters of such an actuator is elucidated from the viewpoint of its best utilization in flywheel stabilization systems. The dynamics of one plane channel of the system is examined. Author

N77-12405# Witwatersrand Univ., Johannesburg (South Africa). School of Mechanical Engineering.
OPTIMUM COMPRESSION RATIOS OF STIRLING CYCLE MACHINES
C. J. Rallis and I. Urieli Jun. 1976 17 p refs
(Rept-68; ISBN-0-35494-395-1) Avail: NTIS HC A02/MF A01

The approach adopted in order to establish basic trends is to return to the simple idealized closed form or cycle analysis, but without the mechanical or thermodynamic restrictions imposed by Schmidt. In particular, it is proposed to examine the effects of nonisothermal compression and expansion as well as of imperfect regeneration. Author

N77-12406*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EMISSIONS AND PERFORMANCE OF CATALYSTS FOR GAS TURBINE CATALYTIC COMBUSTORS
David N. Anderson 1977 42 p refs Proposed for presentation at 22d Ann. Intern. Gas Turbine Conf., Philadelphia, 27-31 Mar. 1977; sponsored by ASME
(NASA-TM-X-73543; E-8975) Avail: NTIS HC A03/MF A01 CSCL 21A

Three noble-metal monolithic catalysts were tested in a 12-centimeter diameter combustion test rig to obtain emissions and performance data at conditions simulating the operation of a catalytic combustor for an automotive gas turbine engine. Tests with one of the catalysts at 800 K inlet mixture temperature 300,000 pa (3 atm) pressure, and a reference velocity (catalyst bed inlet velocity) of 10 m/sec demonstrated greater than 99 percent combustion efficiency for reaction temperatures higher than 1300 K. With a reference velocity of 25 m/sec the reaction temperature required to achieve the same combustion efficiency increased to 1380 K. The exit temperature pattern factors for all three catalysts were below 0.1 when adiabatic reaction temperatures were higher than 1400 K. The highest pressure drop was 4.5 percent at 25 m/sec reference velocity. Nitrogen oxides emissions were less than 0.1 g NO_2/kg fuel for all test conditions. Author

N77-12407# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service des Composants Inertiels et Technologie Electromecanique.

EVALUATION TECHNIQUES FOR BALL BEARINGS USING A HIGH SPEED TEST BENCH [TECHNIQUES D'EVALUATION DES ROULEMENTS A BILLES SUR BANC D'ESSAIS A HAUTE VITESSE]

M. Daoust 30 Dec. 1975 56 p In FRENCH
(Contract DTEn-75-70-122)
(LRBA-E-602-NT-42/SIE) Avail: NTIS HC A04/MF A01

A mathematical model for the friction torque of ball bearings used for inertial guidance gyroscopes is presented. Its validity was checked against measurements taken by a high speed dynamic test bench. ESA

N77-12408# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service des Composants Inertiels et Technologie Electromecanique.

BALL BEARINGS FOR GYROSCOPE AXIS. SIMPLE MOVEMENTS OF THE RETAINER [ROULEMENTS A BILLES POUR TOUPIE DE GYROSCOPES. MOUVEMENTS SIMPLES DE LA CAGE]

Mommessin 7 Apr. 1976 17 p refs In FRENCH
(Contract DTEn/STEN-75-70-122)
(LRBA-E-602-NT-49/SIE) Avail: NTIS HC A02/MF A01

The various simple movements of the retainer of a gyroscope ball bearing are described and analyzed. The movements analyzed are the whirl, the synchronous whirl, the stable mode, and the ball jump mode. An oblique contact is assumed with the internal ring fixed, and retainer guidance is assumed to be performed by the external ring. ESA

N77-12409# National Centre of Tribology, Risley (England). European Space Tribology Lab.

THERMAL VACUUM QUALIFICATION TESTS ON A DORNIER MEDIUM SPEED DESPIN MECHANISM

A. J. Walton and D. A. Appleton Jul. 1976 62 p Sponsored by ESA
(ESA-ESTL-20; ESA-CR(P)-846) Avail: NTIS HC A04/MF A01

A despin mechanism manufactured by Dornier System under the ESTEC Supporting Technology Program was submitted to thermal vacuum qualification tests. This included four separate tests, each of 8 hours duration, with the mechanism operating at 60 revolutions a minute, whilst being subjected to temperatures more extreme than those anticipated in a typical satellite operation. In addition, tests simulating two different temperature conditions during satellite eclipse in the earth's shadow, with four eclipse cycles per test, were carried out. Measurements were made of motor torque, rotational speed, power slip ring voltage drop and temperatures throughout the mechanism. After some initial difficulties due to a diametral tolerance, which became apparent only when the mechanism was subjected to a thermal gradient in vacuum, operation was within specification during all the tests. Results of the measurements are summarized. Author (ESA)

N77-12410# Massachusetts Inst. of Tech., Cambridge.

TASK DESCRIPTORS FOR AUTOMATED ASSEMBLY M.S. Thesis

Sergio N. Simunovic Jan. 1976 110 p refs Prepared in cooperation with Charles Stark Draper Lab., Inc.
(Grant NSF ATA-74-18173)
(PB-255545/6; NSF/RA-760127; T-624) Avail: NTIS HC A06/MF A01 CSCL 13H

The construction of assembly task descriptors for use in automated assembly systems is analyzed in terms of the information contained in the parts to be assembled, the actual positioning devices to be used and the operation characteristics that the assembly system would require. A general representation of an assembly system and an error analysis design tool, for the assembly system and task descriptors partial evaluation, are developed. Two manipulators, a commercially available one and the design of a prototype arm for an experimental assembly system, are evaluated through the use of this design tool. GRA

N77-12411# Pennsylvania State Univ., University Park. Materials Research Lab.

COATING SCIENCE AND TECHNOLOGY Final Report, 2 Jan. - 30 Nov. 1975

Bruce E. Knox and K. Vedam Mar. 1976 88 p refs
(Contract F19628-75-C-0110; ARPA Order 2415)
(AD-A025487; RADC-TR-76-95) Avail: NTIS HC A05/MF A01 CSCL 20/6

The objective of this research was to develop a thorough understanding of films applied as coatings on materials transparent to 10.6 and 3-5 micrometer radiation. The approach included the preparation of films by sputtering or ion-plating, chemical and physical vapor deposition, and plasma polymerization. The materials studied were CdTe and Ge. New efforts to deposit tetrahedral carbon films were also included. Characterization techniques for the coatings included infrared spectrometry, laser-Raman spectrometry, ion scattering spectrometry, Auger electron spectrometry, scanning electron microscopy, X-ray diffraction, X-ray emission analysis, ellipsometry, and durability tests. The preparation of cadmium telluride films by sputter deposition was thoroughly investigated. Optical absorption studies were conducted with CdTe films deposited on KCl substrates. The oxidation of germanium films sputter-deposited on KCl substrates was investigated. These studies will be used to provide guidelines for the selection of the best materials, processes and process controls for the production of good optical coatings for infrared components. GRA

N77-12412# Mechanical Technology, Inc., Latham, N.Y.

ANALYSIS OF CAGE MOTION Final Report, 15 May - 15 Nov. 1975

Pradeep K. Gupta Dec. 1975 54 p refs
(Contract F33615-75-C-2061; AF Proj. 3048)
(AD-A025735; MTI-76TR14; AFAPL-TR-76-28) Avail: NTIS HC A04/MF A01 CSCL 13/9

Generalized dynamic motion of the cage in a rolling bearing is formulated in terms of the classical differential equations of motion. Both the ball and roller cages are considered and also the cage is allowed to be guided either on the race (outer or inner) or the rolling elements themselves. Simplified models for interactions between rolling elements and cage and also for those between the cage and race presented. A review of the available experimental data on cage motion is undertaken in order to qualitatively understand the possible instabilities and their relation to cage motion parameters. GRA

N77-12413# DARCOM Intern Training Center, Texarkana, Tex.

AIRCRAFT TIRES: BALANCE PAD BONDING INTEGRITY Final Report

Tracy Worthington Apr. 1976 62 p refs
(AD-A024815; DARCOM-ITC-02-08-76-114) Avail: NTIS HC A04/MF A01 CSCL 01/3

The purpose of this research was to determine the cause of balance pad bonding failures and establish the production requirements necessary to provide a satisfactory bond. The scope of this work was limited to the tire rebuilding facilities at Red River Army Depot, Texarkana, Texas. Representative tires were compared for elongation due to inflation and the present installation procedure. Revised procedures were then formulated and applied to a selected set of tires. These tires were then tested to current conformance standards. Based on these findings, it was recommended that the present mechanical holding device not be replaced. It is also suggested that additional studies be undertaken to improve productivity. GRA

N77-12414# British Steel Corp., Sheffield (England). Information Services.

HYDRAULIC PRESS: RDL REDCAR

P. Holmes Jun. 1976 11 p
(PB-256050/6; GS/EX/8/1/75/C) Avail: NTIS HC A02/MF A01 CSCL 13I

A large hydraulic press used for bending plate has recently given problems, causing slow production rates when shaping the large sections of plate which are cold worked. This followed the change from water to an oil hydraulic supply to the ram of the press. Strain measurements were taken at 23 positions to evaluate the existing stress levels with a view to increasing the applied hydraulic pressure. No significant increase in pressure could be tolerated without adversely affecting the margin of safety to both personnel and plant. GRA

N77-12415# British Steel Corp., Sheffield (England). Information Services.

METALLURGICAL FACTORS CONTROLLING WELD METAL TOUGHNESS IN THE SEAM WELDING OF LINE PIPE

J. G. Garland and P. R. Kirkwood Jun. 1976 45 p refs
(PB-256057/1; GS/PROD/832/1/76/C) Avail: NTIS HC A03/MF A01 CSCL 13H

The importance of the microalloying elements columbium and vanadium in controlling the toughness of submerged arc weld metal in seam welded microalloyed line pipe was discussed. The role of excess vanadium in promoting low energy intergranular fracture in the charpy-v-notch impact test was highlighted. The shortcomings of commercially available C-Mn and C-Mn-Mo electrodes with respect to weld metal toughness were demonstrated. A means of overcoming this problem by the use of a C-Mn-Ti-Mo-B electrode with a fully basic flux suitable for high speed dc/ac line pipe welding was outlined, and the metallurgical background is described. GRA

N77-12416# British Steel Corp., Sheffield (England). Information Services.

THE WELDING OF ORGANIC COATED STEELS AND LAMINATES

R. K. Snee Jun. 1976 19 p refs
(PB-256056/3; SM/894/D) Avail: NTIS HC A02/MF A01 CSCL 13H

The welding characteristics of a range of metal/organic composite materials, colorcoat, colorsteel, stelvetite and sound deadened steel laminates, are summarized together with the various welding processes that are used to weld these materials. A variety of processes are used but the best results are obtained by using resistance welding methods which localize the overall heat input. The presence of the organic coating layer causes complete insulation during conventional resistance spot welding and consequently it is necessary to utilize an initial shunt path/capping piece. Typical welding procedures used with the capping piece technique are discussed. GRA

N77-12417# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.

EFFECT OF SELF-LOCKING NUTS ON TORQUE-TENSION RELATIONSHIP Final Report

M. J. Zurko 29 Dec. 1975 78 p
(AD-A024893; NADC-75359-30) Avail: NTIS HC A05/MF A01 CSCL 13/5

Testing was conducted to determine torque-tension relationship for self-locking nuts. The test results indicated that torque wrench method is not accurate for determining preload when fasteners are preloaded to 75-80 percent of their ultimate tensile strength. The accuracy of torque wrench method deteriorates even more if fasteners are used for more than one cycle application. There was also significant difference in preload between all metal nuts and nuts with nonmetallic insert. The fastener preload variation decreased with larger fasteners. Author (GRA)

N77-12418# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.

OUTDOOR EVALUATION: STUDY MEANS OF ASSURING MIL-D-6054 STEEL DRUMS ARE HERMETICALLY SEALED Final Report, 1974 - 1976

John A. Hincks May 1976 19 p
(AFPEA Proj. 72-P7-17(6A))
(AD-A025809; DSPS-76-18) Avail: NTIS HC A02/MF A01 CSCL 11/1

The requirement in accordance with MIL-P-116 that Method IId (rigid metal containers) have a water vaporproof seal is well understood. What is not well understood is that simply closing the container may, in fact, not assure an effective seal. This outdoor test study describes a simple, inexpensive valve to test and assure a hermetic seal or, through the use of a new 'question mark' shaped type of gasket, be reasonably certain that a seal was obtained without testing. Author (GRA)

N77-12419# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

HOT PRESSURE WELDING OF ALUMINUM ALLOYS Final Report, Jan. 1970 - Dec. 1974

Guinn E. Metzger Mar. 1976 59 p refs
(AF Proj. 7351)
(AD-A025966; AFML-TR-75-163) Avail: NTIS HC A04/MF A01 CSCL 13/8

The welding of butt joints in 1100, 6061, 7075 aluminum by the hot pressure welding process with a vacuum atmosphere has been studied. Solid cylinders were welded in a closed die. The tensile strength joint efficiency of 1100 aluminum welds was 100% at a welding temperature of 600 C with 24% weld deformation and also at 500 C and 44%. Alloy 7075 welded at 490 C and with 20-30% deformation exhibited a joint efficiency of 100% in the as-welded condition and 93% in the T6 condition. The tensile elongation of welds was good, except for 7075 aluminum in the T6 condition. This was about 1%, which increased to about 2% after postweld diffusion treatment. Abrasion of the faying surfaces by preweld relative movement of a ringshaped specimen on a flat sheet was of only limited effect in improving weld strength. Joint efficiencies of 100% (based on annealed strengths) were achieved with 1100 and 6061 aluminum, but not with 7075 aluminum. Author (GRA)

N77-12420# Boeing Aerospace Co., Seattle, Wash.

CERAMIC AIRFRAME BEARINGS Final Report, Feb. 1975 - Feb. 1976

Jan W. VanWyk Feb. 1976 106 p refs
(Contract N00019-75-C-0170)
(AD-A025142; D180-19447-1) Avail: NTIS HC A06/MF A01 CSCL 13/9

A friction and wear screening investigation of ceramic coatings, lubricants, and lubricant reservoir designs was conducted for an 1100 F bearing application. A slotted reservoir design was evaluated in both elevated- and room-temperature screening tests. Load-spectrum and life bearing tests were conducted on a cylindrical lubricant reservoir design. These tests demonstrated a maximum load capacity of 22,000 psi and a life of 19,862 cycles at 15,000 psi. An improved lubricant reservoir ceramic bearing design was developed using a hot-pressed silicon nitride ball sliding against an alumina coating on titanium. Tests conducted with the slotted reservoir design bearings at elevated temperatures resulted in early failure of the bearing. Axial cracks in the silicon nitride ball were the apparent cause of bearing failure. Room-temperature tests of the slotted reservoir design were conducted under conditions simulating a hydrofoil flap hinge application. The tests demonstrated a significant improvement in performance. A maximum load capacity of 28,000 psi and a wear life of 60,000 cycles at 15,000 psi were obtained with this design. Author (GRA)

N77-12421# Iowa Univ., Iowa City. Div. of Materials Engineering.

OPTIMAL DESIGN OF MECHANICAL SYSTEMS WITH INTERMITTENT MOTION Final Technical Report, May 1975 - May 1976

R. C. Huang, E. J. Haug, Jr., and J. G. Andrews May 1976 92 p refs
(Contract DAAA09-75-C-2022)
(AD-A025010; TD-24) Avail: NTIS HC A05/MF A01 CSCL 13/9

This report treats the optimal design of mechanical systems which exhibit intermittent motion. Sensitivity of cost and constraint functions to changes in design are obtained by applying theorems from the calculus of variations and by using first-order approximations of functions appearing in the problem. A steepest descent method is used to obtain the optimum solution. The general method developed here is applied to a one degree of freedom vibration absorber, and to a three degree of freedom multi-mass, cammed mechanical system. Numerical results for these problems are presented and discussed. Author (GRA)

N77-12422# Joint Publications Research Service, Arlington, Va.

CALCULATION OF COST IN DESIGN OF MACHINERY

Mikhail Ivanovich Patov 29 Nov. 1976 170 p refs Transl. into ENGLISH of Raschety Sebestoimosti Proyektiruyemykh Mashin (Moscow), 16 Aug. p 1-180
(JPRS-68285) Avail: NTIS HC A08/MF A01

An analysis of the calculation of the production costs during preproduction designing and engineering and of the economically

allowable production cost and machinery price is presented.
Author

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N77-12423*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRAVELING-WAVE TUBE RELIABILITY ESTIMATES, LIFE TESTS, AND SPACE FLIGHT EXPERIENCE
Vincent R. Lalli and Carlton E. Speck 1977 10 p refs Proposed for Presentation at the Ann. Reliability and Maintainability Symp., Philadelphia, 17-19 Jan. 1977
(NASA-TM-X-73541; E-8973) Avail: NTIS HC A02/MF A01 CSCL 14D

Infant mortality, useful life, and wearout phase of twt life are considered. The performance of existing developmental tubes, flight experience, and sequential hardware testing are evaluated. The reliability history of twt's in space applications is documented by considering: (1) the generic parts of the tube in light of the manner in which their design and operation affect the ultimate reliability of the device, (2) the flight experience of medium power tubes, and (3) the available life test data for existing space-qualified twt's in addition to those of high power devices.
Author

N77-12424# Elektronikcentralen, Hoersholm (Denmark).
PRODUCT ASSURANCE PROGRAMME PLAN FOR HIGH RELIABILITY PRODUCTS
E. Andersen Feb. 1976 67 p
(ECR-59) Avail: NTIS HC A04/MF A01

A product assurance program plan to establish an organized approach to the product assurance provisions pertinent to the design, fabrication, test, and delivery of high reliability equipment is described.
Author

N77-12425# Battelle Pacific Northwest Labs., Richland, Wash.
INVESTIGATE FEASIBILITY OF UTILIZING ACOUSTIC EMISSION METHODS TO EVALUATE THE INTEGRITY OF A PROTOTYPE ADAPTS OIL STORAGE CONTAINER Final Report
P. H. Hutton, J. R. Skorpik, and J. F. Dawson Dec. 1975 38 p refs
(Contract DOT-CG-23223-A)
(AD-A025910; USCG-D-37-76) Avail: NTIS HC A03/MF A01 CSCL 17/1

This report discusses acoustic emission characteristics of nylon fiber-polyurethane material used in the U.S. Coast Guard's Prototype Oil Storage Container, a subsystem of the Air Deliverable Anti-Pollution Transfer System (ADAPTS). Characteristics were determined by laboratory testing. Results are considered in the interest of potential use of acoustic emission methods to evaluate the physical integrity of items manufactured with this material. Generation of acoustic emission and its relationship to material loading were favorable to the intended application. The specific application is concluded to be impractical, however, due to high attenuation of acoustic emission signals in the material. Acoustic emission does have potential application to this type of material where a low attenuation signal transmission path such as metal sheathing is available.
Author (GRA)

N77-12426# DARCOM Intern Training Center, Texarkana, Tex.
MODELING RELIABILITY AND MAINTAINABILITY CHARACTERISTICS OF PRODUCTION SYSTEMS VIA THE MARKOV PROCESS Final Report
Stephen R. Mapley Apr. 1976 51 p refs
(AD-A025121; DARCOM-ITC-02-08-76-208) Avail: NTIS HC A04/MF A01 CSCL 13/8

This report develops generalized mathematical models of production systems by means of Markov chain theory. The production models are developed describing the reliability and maintainability characteristics and production rates of a system. Several methods for reducing the number of states of certain models, and improving the accuracy of certain models are discussed. A method for modeling non-exponential PDF's of time to failure by Markov chains is also presented.
GRA

N77-12427# DARCOM Intern Training Center, Texarkana, Tex.
INVESTIGATION OF THE EFFECT OF INSPECTION ERROR ON SEQUENTIAL SAMPLING PLANS Final Report
Albert J. Reinecke May 1976 101 p refs
(AD-A024760; DARCOM-ITC-02-08-76-204) Avail: NTIS HC A06/MF A01 CSCL 13/8

This paper considers the effects of inspection errors which are functions of the inspection time allowed per item, the incoming quality, the inspection time and incoming quality, as well as constant values on sequential sampling plans. These adjusted sampling plans specify the procedure which should be used when inspection errors are considered.
Author (GRA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N77-12428 Catholic Univ. of America, Washington, D.C.
FINITE DIFFERENCE ENERGY TECHNIQUES FOR ARBITRARY MESHES APPLIED TO LINEAR AND NONLINEAR PROBLEMS WITH IRREGULAR DOMAINS Ph.D. Thesis
Vjekoslav Pavlin 1976 143 p
Avail: Univ. Microfilms Order No. 76-23364

A finite difference energy technique for arbitrary mesh spacings similar to a finite element format was developed for solving two-dimensional problems in engineering mechanics. The method uses the principle of minimum potential energy. An important advantage of the energy approach is the use of partial derivatives of only up to the second order which can be readily and accurately expressed by finite differences. A Taylor series expansion is essentially used as a shape function, retaining terms up to the second order to describe displacement functions. When boundary conditions require, the Taylor series expansion can be easily expanded to include terms of a higher order. The method discretizes the total domain of the structure to smaller portions by the use of regular or irregular mesh. The use of irregular meshes allows the application of the method to the problems with irregular domains. In such cases, portions of the boundary are subsequentially approximated by polynomials.
Dissert. Abstr.

N77-12429 Rice Univ., Houston, Tex.
FINITE DEFORMATION OF ELASTIC-PLASTIC AND ELASTIC/VISCOPLASTIC CONTINUA Ph.D. Thesis
David Loyd Garrett 1976 128 p
Avail: Univ. Microfilms Order No. 76-21675

Initial-boundary value problems involving finite, isothermal, quasi-static deformation of a broad class of solids exhibiting both elastic and plastic behavior are examined. Before yielding the materials have only elastic properties, while in the inelastic range, the materials exhibit isotropic and anisotropic strain hardening or strain softening, with or without rate dependence. Proper constitutive relations for these materials are developed and extremum principles which characterize the rate boundary value problem, along with conditions for uniqueness and stability, are derived. Application of the principles to solution of initial-boundary value problems, along with use of the uniqueness conditions for approximate investigation of limit states, is discussed. An example, a confined compression test of a porous limestone, is examined. For a particular sample geometry, certain combinations of material properties, for which sample failure upon continued loading may be expected, are determined.
Dissert. Abstr.

N77-12430# Flugzeugwerke, Emmen (Switzerland).
FALSTAFF. DESCRIPTION OF A FIGHTER AIRCRAFT LOADING STANDARD FOR FATIGUE EVALUATION
Mar. 1976 71 p refs Prepared in cooperation with Laboratorium

fuer Betriebsfestigkeit, Darmstadt (West Ger.) Natl. Aerospace Lab. Amsterdam, (Netherlands) and Industrieanlagen-Betriebsgesellschaft M.B.H., Ottobrunn (West Ger.)
Avail: NTIS HC A04/MF A01

A mathematical model for investigating the fatigue performance of structural materials and configurations is presented. This proposed loading standard has been adopted by Germany and the Netherlands and used to test transport aircraft wing root bending. Algorithms and input data for applying the program to fighter aircraft wing bending are presented. Author

N77-12431# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE UNDER COMBINED OUT OF PHASE MULTIAXIAL STRESSES
V. Grubisic and A. Simbuerger Apr. 1976 9 p refs Repr. from Fatigue Testing and Design, v. 2, p 27.1-27.28 Presented at S E E Intern. Conf. London, 5-9 Apr. 1976
Avail: NTIS HC A02/MF A01

The results concerning the fatigue behavior of carbon steel under constant and changing direction of principal stresses including the effect of mean stress, phase difference, and stress concentration are presented. The testing program included both thin walled cylinders under combined axial load and internal pressure and combined axial load and torsion, and fillet-notched specimens under combined bending and torsion. The results show that the known procedures, i.e. defining the interference plane with the most severe combination of mean value and amplitude for an equivalent stress can be applied only as long as the direction of the principal stresses remains constant. If the direction of principal stresses is changing all known procedures for strength evaluation will fail, dependent on the material and range of loading. Therefore a new theoretical concept was worked out to determine the fatigue behavior of structural components in the case of combined multiaxial stress. Fatigue criteria for different materials -ductile, semiductile, and brittle- are presented. Author

N77-12432# Lockheed Missiles and Space Co., Palo Alto, Calif.
DYNAMIC INTERACTION OF SHELLS AND PLATES WITH THE AMBIENT MEDIUM
A. G. Gorshkov 6 Oct. 1976 22 p refs Transl. into ENGLISH from Inzh. Zh., Mekh. Tverd. Tela (Moscow), no. 2, 1976 p 165-178
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Illinois 60616

A certain class of problems from the domain of aero-hydroelasticity is examined. Included in the survey are papers published in the periodical press within the last years. Fundamental attention is paid to problems related to the effect of shocks on elastic shells of revolution and to the submersion of elastic bodies in water. An analysis of research on these and similar problems is also represented in a number of monographs and in survey papers. Author

N77-12433# Kyushu Univ., Fukuoka (Japan).
SPECKLE PATTERN CORRELATION METHOD FOR MEASUREMENT OF SURFACE STRUCTURAL CHANGES CAUSED BY FATIGUE
Seinosuke Sumi 1976 5 p refs Repr. from the Proceedings of the 19th Japan Congress on Materials Research (Kyoto), 1976 p 17-21
Avail: NTIS HC A02/MF A01

The development of the speckle correlation method is proposed and its application to detection of fatigue damage of 2024-T3 aluminum alloy subjected to a constant cyclic strain amplitude is shown. Author

N77-12434# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
ON THE DYNAMIC STRESS CONCENTRATION OF NOTCHED PLATES AS INDUCED BY TENSILE STRESS WAVES, VOLUME 41, NO. 4
Kunihiko Kurokawa and Kozo Kawata May 1976 43 p refs (ISAS-540) Avail: NTIS HC A03/MF A01

The dynamic stress concentration of notched plates as induced by tensile stress waves was analyzed numerically using the finite element method, and experimentally using the high speed photoelastic technique. The results were then compared with the approximate solution newly derived by the one dimensional theory of stress wave propagation, and the effectiveness of this approximate solution of the dynamic stress concentration was confirmed. Author

N77-12435*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYTICAL COMPARISON OF EFFECTS OF SOLID-FRICTION AND VISCOUS STRUCTURAL DAMPING ON PANEL FLUTTER
Herbert J. Cunningham Washington Nov. 1976 36 p
(NASA-TN-D-8263; L-10914) Avail: NTIS HC A03/MF A01 CSCL 13M

A Galerkin modal analysis is presented that accounts for the effects of both solid friction and viscous structural damping on panel flutter, based on unsteady aerodynamic forces from supersonic potential flow. The eigensolutions are made by complex eigenvalue computer routines. Markedly different effects on the flutter boundary of the two types of structural damping are obtained. This result establishes that there is not, in general, an 'equivalent viscous' damping for solid-friction damping. For the limiting case of the static-aerodynamic approximation, a substantially different flutter dynamic pressure is obtained for solid friction identically zero compared with solid friction approaching zero as a limit. Use of the quasi-static aerodynamic approximation eliminates that difference. Author

N77-12436*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRUCTURAL ANALYSES FOR THE MODIFICATION AND VERIFICATION OF THE VIKING AEROSHELL
Wendell B. Stephens and Melvin S. Anderson Washington Nov. 1976 53 p refs
(NASA-TN-D-8300; L-10751) Avail: NTIS HC A04/MF A01 CSCL 13M

The Viking aeroshell is an extremely lightweight flexible shell structure that has undergone thorough buckling analyses in the course of its development. The analytical tools and modeling technique required to reveal the structural behavior are presented. Significant results are given which illustrate the complex failure modes not usually observed in simple models and analyses. Both shell-of-revolution analysis for the pressure loads and thermal loads during entry and a general shell analysis for concentrated tank loads during launch were used. In many cases fixes or alterations to the structure were required, and the role of the analytical results in determining these modifications is indicated. Author

N77-12437# Southampton Univ. (England). Inst. of Sound and Vibration Research.
MEASUREMENT OF THE MOTION OF TREES IN TWO DIMENSIONS
R. G. White, M. F. White, and G. J. Mayhead, (Forestry Comm.) [1975] 24 p refs
(ISVR-TR-86) Avail: NTIS HC A02/MF A01

Several methods for the analysis of tree vibration characteristics are described. Acceleration data derived from strain gage accelerometers with associated instrumentation are satisfactory, and damping ratios may be calculated with the log decrement method. The fundamental mode was dominant in all sway tests although other modes of vibration were present. The tree crown is responsible for a large part of tree damping but considerable energy absorption occurs in tree-to-tree contact with adjacent trees. Author (ESA)

N77-12438# Stuttgart Univ. (West Germany). Inst. fuer Theoretische und Angewandte Physik.
BOUNDS FOR EFFECTIVE ELASTIC MODULI OF DISORDERED MATERIALS. PART 1: FORMAL THEORY
E. Kroener 1976 20 p refs Sponsored by Volkswagenwerk Found.
Avail: NTIS HC A02/MF A01

Based on a theory of P. H. Dederichs and R. Zeller a formal theory of the bounds for the effective elasticity moduli of disordered materials was developed. The theory of Dederichs and Zeller applies to bounds of odd order n for the effective elastic moduli of linearly elastic disordered materials. The bounds are established by use of the statistical information given in

terms of correlation functions up to the order n (= 1, 3, 5 ...). This theory was extended to include the bounds of even order n. How these bounds can be optimal under the given statistical information is indicated. The results are obtained in forms which resemble Neumann series. Since the occurring correlation functions are not specified and, therefore, the multiple integrals not calculated, these results are formal rather than explicit.
Author (ESA)

N77-12439# Institut fuer Festkoerpermechanik, Freiburg (West Germany).
GROWTH OF PART-THROUGH CRACKS IN SIMPLE CONSTRUCTION ELEMENTS Final Report
L. Hodulak, H. Kordisch, S. Kunzelmann, and E. Sommer 1976 44 p refs In GERMAN
(IFKM-76/1) Avail: NTIS HC A07/MF A01

Propagation of part-through cracks in thick walled construction elements was investigated on aluminum alloys in which notches of different geometry were carved under tensile stress. Marking lines were used to follow the crackfront at determined points of time. The following crack configurations were investigated: part-through cracks in disks, part-through cracks in semitubes, corner cracks in disks, and drilling corner cracks in disks. Typical crack propagation characteristics were interpreted as interaction between local energy supply (load factor) and local energy consumption (crack resistance). A simple model describing the real development of the crack dimensions is presented. ESA

N77-12440# Weidlinger Associates, Menlo Park, Calif.
PRETEST PREDICTION OF DYNAMIC STRUCTURAL RESPONSE TO GROUND MOTION EVENT ESSEX-5 Final Report, Oct. 1974 - May 1975
J. Isenberg and S. H. Pang 1 Jun. 1975 97 p refs
(Contract DNA001-74-C-0254; DNA Proj. NWED-QAXSC061) (AD-A023911; R-7518; DNA-3821F) Avail: NTIS HC A05/MF A01 CSCL 19/4

This report presents structural response predictions for ESSEX - v , which was scheduled for October 1975. Ground motion input on the basis of previous essex events is applied to analytic models of a bridge, a pipeline a POL storage tank, a hangarette, and a buried arch and rectangular structure. Response predictions, using finite element methods, for gage ranging and recommendations on locating the structures at the test site are given. GRA

N77-12441# Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
A LABORATORY EVALUATION OF SULPHUR-ASPHALT PAVING MIXTURES Final Report
Lacey A. Glascock Feb. 1976 62 p refs Sponsored by Fed. Highway Admin.
(PB-254911/1; LA-74-1B(B)-FoRR-100; FHWA-LA-RR-100) Avail: NTIS HC A04/MF A01 CSCL 13C

A laboratory program is reported for preparing and testing Marshall specimens to evaluate the physical properties of sulphur-asphalt-sand paving material using Louisiana sand deposits and asphalt cements AC-20 and AC-40. Principal objectives of the research effort are to familiarize Department of Highway personnel with basic properties of this new paving material and verify results obtained by others through previous research evaluations. Test findings demonstrate that desirable physical properties based on the Marshall method of mix design can be obtained with various combinations of sulphur, asphalt and sand mixed in a manner similar to asphaltic concrete. The material exhibited somewhat higher Marshall stabilities with a slightly greater sensitivity to water action, based on Marshall immersion tests, than conventional asphaltic concrete mixtures.
GRA

N77-12442# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
SCANNING ELECTRON MICROSCOPY, ION SCATTERING AND SECONDARY ION MASS SPECTROMETRY TO CHARACTERIZE APPARENT ADHESIVE FAILURE IN AN ADHESIVE BOND Interim Report, Nov. 1974 - Nov. 1975
W. L. Baun Mar. 1976 44 p refs
(AF Proj. 7340)
(AD-A025615; AFML-TR-76-30) Avail: NTIS HC A03/MF A01 CSCL 13/6

Frequently it is not easy using visual or even microscopic examination of an adhesive joint to determine after physical testing whether an apparent adhesive failure occurred at the original interface due to improper wetting or at some new interface leaving behind a thin layer of adhesive. Elemental analysis techniques such as ion scattering spectrometry (ISS) and secondary ion mass spectrometry (SIMS) combined with Scanning Electron Microscopy (SEM) are capable of determining the locus of failure in an adhesive joint. The use of ISS and SIMS in combination is shown for investigating adhesive bonding phenomena. The operating parameters as well as advantages and disadvantages of each are summarized. ISS-SIMS data are shown for two adherend surfaces which broke in a lap shear test by apparent cohesive failure in both the adhesive and adherend. Data are also shown for failure surfaces from peel test and thin adherend double cantilever beam (wedge test) specimens.
Author (GRA)

N77-12443# California Dept. of Transportation, Sacramento. Transportation Lab.
CALIFORNIA TRIALS WITH LEAN CONCRETE BASE (LCB) Interim Report, Apr. 1972 - Jul. 1975
B. F. Neal, J. H. Woodstrom, and D. L. Spellman Oct. 1975 32 p refs Sponsored by FHWA
(PB-254035/9; CA-DOT-TL-5167-3-75-37; Rept-635167) Avail: NTIS HC A03/MF A01 CSCL 13C

Details of two large-scale field trials of lean concrete base (LCB) are presented. By adding additional cement and water to aggregates used for cement treated base (CTB), a plastic mix is produced which can be placed with a slipform paver using only internal vibration for compaction. Between 50 and 100 percent additional cement was required to produce LCB with compressive strength comparable to the in-place strength of CTB. LCB was found to have greater stiffness and a more sealed and abrasion resistant surface than CTB. Some of the increased costs due to additional cement are offset by g and the use of less placing and finishing equipment.
GRA

N77-12444# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SYMPOSIUM ON NONDESTRUCTIVE TEST AND EVALUATION OF AIRPORT PAVEMENTS
Ronald L. Hutchinson and Jim W. Hall May 1976 415 p refs Conf. held at Vicksburg, Miss., 18-20 Nov. 1975
(AD-A025442) Avail: NTIS HC A18/MF A01 CSCL 01/5

The 22 papers presented included the Federal Government's role in pavement evaluation; the airport operators' and airlines' views on the use of nondestructive evaluation procedures; descriptions of procedures and equipment that have been developed and used in nondestructive testing; results of research under way; and one paper discussing the value of nondestructive testing techniques for pavement evaluation. GRA

N77-12445# Purdue Univ., Lafayette, Ind. School of Aeronautics.
DYNAMIC RESPONSE OF ANISOTROPIC LAMINATED PLATES UNDER INITIAL STRESS TO IMPACT OF A MASS Annual Report, 1 May 1973 - 1 May 1974
C. T. Sun and S. Chatopadhyay Wright-Patterson AFB, Ohio AFML Mar. 1976 44 p refs
(Contract F33615-73-C-5112; AF Proj. 7342)
(AD-A025906; AFML-TR-74-258) Avail: NTIS HC A03/MF A01 CSCL 11/4

The central impact of a mass on a simply-supported laminated composite plate under initial stress is investigated. The contact force and the dynamic response of the plate are obtained by solving a non-linear integral equation. The energy transferred from the mass to the plate during impact is also obtained by use of a normalized contact force. It is found that a higher initial tensile stress elevates the maximum contact force, but reduces the contact time, the deflection, and the stresses. It is also noted that a higher tensile initial stress results in less energy transfer from the striking mass to the plate.
GRA

N77-12446# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
OPTIMUM SUPPORT DAMPING FOR A VIBRATING BEAM Final Report, 1 Nov. 1975 - 1 Jan. 1976

James C. MacBain and J. Genin Feb. 1976 16 p refs
(AF Proj. 3066)
(AD-A025106; AFAPL-TR-76-14) Avail: NTIS
HC A02/MF A01 CSCL 13/13

A method for determining the optimum support damping of a flexibly supported cantilever beam using an analogous lumped mass model is described. The optimum system damping is determined as a function of rotational end-fixity of the cantilever support interface. The damping value based on the lumped mass model is found to be in good agreement with the damping value based on a mathematical model of a continuous cantilever beam. Author (GRA)

N77-12447# Southwest Research Inst., San Antonio, Tex.
BLAST PRESSURES INSIDE AND OUTSIDE SUPPRESSIVE STRUCTURES Technical Report, Jun. - Sep. 1975
E. D. Esparza, N. E. Baker, and G. A. Oldham Dec. 1975 37 p refs
(Contract DAAA15-75-C-0083)
(AD-A025504; EM-CR-76042; TR-8) Avail: NTIS
HC A03/MF A01 CSCL 19/4

This report describes methods for estimating shock pressures and vented gas pressures within suppressive structures and for estimated attenuated blast wave properties outside. Data are fitted to scaling laws, and prediction equations given with limits of validity. A computer code for predicting venting pressures is described. GRA

N77-12448# Dayton Univ., Ohio.
NUMERICAL ANALYSIS OF FUEL TANK PENETRATION DYNAMICS Final Report, 1 Feb. - 31 Jul. 1975
M. Rosenblatt, G. E. Eggum, and L. DeAngelo Apr. 1976 94 p refs Prepared in cooperation with California Research and Technology, Inc., Woodland Hills
(Contract F33615-75-C-5156; AF Proj. 4363)
(AD-A025451; AFFDL-TR-76-31; CRT-3000-1) Avail: NTIS
HC A05/MF A01 CSCL 01/3

The dynamic characteristics of fuel tanks which are penetrated by .50 caliber bullets are examined using a 2-D finite difference computer code. The bullet impacts the tank unyawed; however, tumbling is simulated by changing the shape of the bullet in the calculation to match the drag force and associated energy transferred between a real tumbling bullet and the fuel. Complete penetration of a 15 in. deep fuel tank with 1/8 in. aluminum walls is analyzed in the numerical calculation. The calculation includes a description of the Pressure versus time and radius loads on the entrance and exit walls, Pressure-time histories at various stations in the fuel, Deformation of the entrance and exit walls, and Formation of the cavity in the fuel behind the penetrating bullet. GRA

N77-12449# Naval Postgraduate School, Monterey, Calif.
A STUDY OF THE CRACK DAMAGE IN FUEL-FILLED TANK WALLS DUE TO BALLISTIC PENETRATORS M.S. Thesis
Steven Lock Fahrenkrog Mar. 1976 94 p refs
(AD-A025430) Avail: NTIS HC A05/MF A01 CSCL 01/3

A major goal of the hydraulic ram survivability program for aircraft fuel tanks is the development of analytical-numerical tools for the accurate prediction of damage to the tank due to a ballistic projectile. This report presents a method for predicting the amount of cracking of a penetrated tank wall due to the penetrating projectile and the hydraulic ram loading. The method uses computer codes to predict the fluid pressure on the wall and the stresses in the wall. The stresses are compared with empirical data on the fracture of thin cracked plates to obtain a prediction of the final crack length. A comparison of predicted cracks with actual cracks that occurred in plates tested by Naval Weapons Center, China Lake, California is included. Good correlation is obtained when the magnitude of the predicted strains is adjusted to agree with the magnitude of the measured strains by a correction factor. Author (GRA)

N77-12450# Army Materiel Command, Texarkana, Tex.
A TENSILE TESTING EXPERIMENT CORRELATING LOAD WITH ACOUSTIC EMISSION Final Report
Joseph Michael Restaino Nov. 1975 53 p refs
(AD-A024813; USAMC-ITC-02-28-75-102) Avail: NTIS
HC A04/MF A01 CSCL 11/6

By correlating a change of load with a change in acoustic emission counts, there exists a possibility that an alternate method of incipient failure detection can be predicted. This presentation is made in the form of a literature review and a first hand experimental investigation. Fifteen specimens were procured and tested. Load was recorded by the Instron Tensile Test Machine, and the acoustic emissions were recorded on tape. A linear regression analysis was then performed on the data collected. The conclusions drawn from the research indicate that the correlation of load versus acoustic emissions indeed exists. Also, a good indication of incipient failure prediction is the engineering yield point. GRA

N77-12451# California Univ., Los Angeles. School of Engineering and Applied Science.
THEORETICAL ANALYSIS OF ATJS GRAPHITE DISKS FRACTURED BY SPINNING Technical Report, 1975 - 1976
S. B. Batdorf Mar. 1976 47 p refs Sponsored in part by AFOSR
(Contract N00014-76-C-0445)
(AD-A024711; UCLA-ENG-7624) Avail: NTIS
HC A03/MF A01 CSCL 11/2

Refractory materials are frequently used in reentry vehicle nosetips to combat the severe heating conditions encountered. The thermal stresses thereby induced introduce a risk of fracture. To calculate the survival probability, it is necessary to be able to determine the stresses and strains induced by the combined thermal and aerodynamic loads, to find the probability of fracture in each volume element, and from the latter to estimate the survival probability of the entire nosetip. Among the things needed to accomplish this task are sufficiently accurate constitutive laws for the materials employed, and a knowledge of the fracture statistics of the material as affected by specimen size and the (generally biaxial or triaxial) stress state involved. In a recent experimental study to shed light on these matters, ATJS graphite disks and bars were tested to destruction by spinning. The primary objective of the present paper is to show how the uniaxial stress-strain data and uniaxial fracture statistics can be generalized with the aid of theory to stress analyze the rotating disks and also account for the observed failure statistics. It is shown that agreement between theory and experiment is good for both types of problems. GRA

N77-12452# California Univ., San Diego. Dept. of Applied Mechanics and Engineering.
ON ASYMPTOTIC EXPANSIONS AND ERROR BOUNDS IN THE DERIVATION OF TWO-DIMENSIONAL SHELL THEORY Interim Report
S. Nair and E. Reissner May 1976 45 p refs
(Contract N00014-75-C-0158)
(AD-A025677) Avail: NTIS HC A03/MF A01 CSCL 12/1

Known results on asymptotic two-dimensional equations for circular cylindrical shells, including the effects of transverse shear and normal stress deformation, are supplemented by upper and lower bound determinations of influence coefficients, using minimum potential and complementary energy principles in conjunction with asymptotic expansion results. Author (GRA)

N77-12453# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.
ON STRETCHING, BENDING, TWISTING AND FLEXURE OF CYLINDRICAL SHELLS Interim Report
E. Reissner Apr. 1976 29 p refs
(Contract N00014-75-C-0158)
(AD-A025676) Avail: NTIS HC A03/MF A01 CSCL 20/11

The equilibrium differential equations of cylindrical shells, in conjunction with the complementary energy principle, are used for (1) a derivation of constitutive equations for coupled stretching, bending and twisting of thin-walled anisotropic straight beams, and (2) a derivation of influence coefficients for end-loaded cantilever beams, with applications to the problem of shear and twist center location. Author (GRA)

N77-12454# Washington Univ., Seattle. Dept. of Mechanical Engineering.
DYNAMIC FINITE ELEMENT AND DYNAMIC PHOTOELASTIC ANALYSES OF CRACK ARREST IN HOMALITE-100

PLATES Interim Report
A. S. Kobayashi, A. F. Emery, and S. Mall May 1976 28 p refs
(Contract N00014-76-C-0060; NR Proj. 064-478)
(AD-A025626; TR-25) Avail: NTIS HC A03/MF A01

A dynamic finite element code, HONDO, was used to analyze four dynamic photoelastic experiments in which the propagating crack arrested. The time-averaged crack tip velocity in the finite element model was matched with the measured crack tip velocity in the dynamic photoelastic experiments. Dynamic energy release rates were computed by a procedure similar to that used in computing strain energy release rate in static finite element analysis. These directly computed dynamic energy release rates at crack arrest agreed well with those computed from the dynamic stress intensity factors determined photoelastically. The strain energy release rates at crack arrest in the four Homalite-100 plates varied between approximately ten to fifty percent of the critical strain energy release rate, gc, and were approximately 80 percent of the corresponding static strain energy release rates. Author (GRA)

N77-12455# National Bureau of Standards, Washington, D.C. Engineering Mechanics Section.
FINITE ELEMENT SIMULATION OF WELDBONDED JOINT DEFORMATION Final Report
Richard A. Mitchell, Ruth M. Woolley, and S. M. Baker Apr. 1976 14 p refs Presented at the Symp. on Computer Simulation for Materials Applications, Gaithersburg, Md., 19-21 Apr. 1976 Submitted for publication
(PB-256995/2) Avail: NTIS HC A02/MF A01 CSCL 11F

Finite element computer techniques are described that simulate the structural response of weldbonded single lap and double lap joints. A planform analysis articulates the inplane deformation of the joined sheet material and the lap-shear stresses acting through the spotwelds and the adhesive. A longitudinal cross section analysis computes out-of-plane bending effects, particularly important in single lap joints, and adhesive peel stresses. Algorithms are described that simulate several nonlinear modes of response by sequences of linear solutions. Author

N77-12456# Virginia Highway and Transportation Research Council, Charlottesville.
EVALUATION OF TEMPERATURE EFFECTS ON BITUMINOUS PAVEMENT DEFLECTIONS IN VIRGINIA
N. K. Vaswani Apr. 1976 36 p
(PB-255955/7; VHTRC-76-R50) Avail: NTIS HC A03/MF A01 CSCL 13B

Eight satellite projects with asphaltic layer thicknesses varying from 3.5 inches (88 mm) to 13.5 inches (338 mm) were tested for dynaflect deflections during the four seasons of 1974-75. The projects were located throughout Virginia. The evaluation of the deflection data showed the maximum deflection, the area of the deflected basin, and the spreadability and modulus of elasticity of the deflected basin to be functions of the log of the temperature. The asphaltic concrete thicknesses are divided into three groups of 2 to 4 inches (50 to 100 mm), 4 to 10 inches (100 to 250 mm), and 10 to 15 inches (250 to 375 mm) for a correlation of the mean pavement temperature with temperature adjustment factors. Correlation equations and graphs are developed. GRA

N77-12457# DARCOM Intern Training Center, Texarkana, Tex.
AN EMPIRICAL DESIGN PROCEDURE FOR SHAFTS WITH FATIGUE LOADINGS Final Report
James D. Grounds Apr. 1976 43 p refs
(AD-A024785; DARCOM-ITC-02-08-76-017) Avail: NTIS HC A03/MF A01 CSCL 13/9

This report presents a method of designing rotating shafts subjected to combined fatigue loads. In the past, the fatigue strength, a material property necessary for design, has been determined for axial, bending, and torsional loads independently. A general approach to design with combined loads requires a fatigue strength that does not depend on the type of loading. Measured differences in the fatigue strengths are attributed to the size of a shaft. By developing correction factors to be used on the applied bending and torsional loads, the axial fatigue strength can be used for combined loads. The octahedral shear theory and the von Mises-Hencky failure criteria are used in describing a design procedure for solid steel shafts. This approach should be verified experimentally. GRA

N77-12458# California Dept. of Transportation, Sacramento. Structures Div.
PRESTRESS TENDONS ON SHORT RADIUS CURVES Final Report
T. J. Bezouska Oct. 1975 32 p
(PB-256015/9; CA-DOT-DS-4155-1-75-9;
FHWA-RD-76-S0505) Avail: NTIS HC A03/MF A01 CSCL 13B

The friction factor and ultimate tensile strength achieved by multi-strand tendons stressed around short radius curves are discussed. Pre-fabricated tendon of as many as 33 one-half-inch diameter strands, stressed through 1.7 radians of arc in a 10 foot radius develops its normal ultimate strength. The commonly used friction factors for rigid conduit, of $k=0.0002$ and $u=0.25$ were found to be valid for this configuration with some controls. GRA

N77-12459# Kansas Dept. of Transportation, Topeka. Planning and Development Dept.
PAVEMENT SURFACE DYNAMICS FRICTION MEASUREMENT AND ANALYSIS IN KANSAS Final Report, Mar. 1973 - Jul. 1975
Robert E. Worley, Thomas M. Metheny, and F. Wayne Stratton Jun. 1976 58 p refs Sponsored in part by Federal Highway Admin.
(PB-255490/5; FHWA-KS-RD-73-3) Avail: NTIS HC A04/MF A01 CSCL 13B

Friction measurements of 277 test sections of Kansas pavement surfaces were made with a locked wheel skid trailer. Many of them were repeated several times. Stereo-photography evaluation was also conducted on some surface types. Some materials used in certain ways indicate possible superiority, such as chert (chat) aggregate used in Portland cement concrete pavement and slurry seals, but not in hot mixes. Expanded shale and sandstone are also indicated to be good skid resistant aggregates. Seasonal variation of speed gradient was detected for all common Kansas surface types. Frosting has occurred on open-graded mixes when adjacent denser mix types remained frostless. GRA

N77-12460# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
STRESS INTENSITY FACTORS FOR THREE-DIMENSIONAL PROBLEMS
R. Reid Parmerter Apr. 1976 183 p refs
(Contract F04611-75-C-0027)
(AD-A025802; AFRPL-TR-76-30) Avail: NTIS HC A09/MF A01 CSCL 20/12

This report is a collection and distillation of known information about stress intensity factors for three-dimensional problems. Particular emphasis is placed on solutions which are applicable to the problems encountered in solid propellant motors. Each section of the report is organized around a particular configuration of crack and surrounding media: cracks in an infinite domain, embedded cracks in a semi-infinite domain, etc. The cracks which are considered are planar with a circular, elliptical, or parabolic shape. In certain cases (such as crack surface intersections or plate problems) the complete answers are unknown. Controversies and unresolved problems are discussed in the hope of making the limitations of the various solutions clear to the reader. GRA

N77-12461# Naval Research Lab., Washington, D.C.
FRACTURE TOUGHNESS OF PRESSURE VESSEL MATERIALS FOR LIGHT WATER REACTORS Progress Report, period ending 29 Feb. 1976
F. J. Loss May 1976 38 p refs
(Contract AT(49-24)-0207; NRL Proj. M01-40)
(AD-A025808; NRL-MR-3289) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report describes progress in a cooperative research program between the Electric Power Research Institute (EPRI) and NRL on the fracture toughness of steels for nuclear reactor pressure vessels. For its contribution EPRI furnished a major portion of the materials and test specimens for the study by NRL. The program is also being conducted in collaboration with

the Nuclear Regulatory Commission (NRC), Office of Nuclear Regulatory Research, and the Office of Naval Research. Related NRC sponsored work of broader scope is underway at NRL. A portion of the NRC work pertaining to the fracture toughness of nuclear pressure boundary materials is also reported here because of its relevance to the subject effort. The principal objectives of this program are: (1) to characterize the dynamic fracture initiation toughness K sub Id of three heats of LWR pressure vessel steel, (2) to develop experimental and analytical techniques for the interpretation and analysis of notched, three-point bend specimen behavior under impact loading, and (3) to assess the validity of plane strain K sub Id values as projected from the elastic plastic (J integral) analysis of smaller specimens. The present report describes progress in the dynamic toughness assessment of program materials by means of 1-in. (25mm) bend and precracked Charpy-V specimens. Also described is a one-dimensional, theoretical characterization of the forces and bending moments developed during impact of a notched beam.

Author (GRA)

N77-12462# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

DURABILITY AND BEHAVIOR OF PRESTRESSED CONCRETE BEAMS. REPORT 5: LABORATORY TESTS OF WEATHERED PRETENSIONED BEAMS

Edward F. ONeil Jun. 1976 42 p refs

(AD-A025694; WES-TR-6-570-5) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report is the fifth in a series describing a study which is being conducted to develop information on the durability of prestressed (pretensioned and posttensioned) concrete beams. This report describes tests and observations on two beams that had been exposed to severe weathering for 16 years in a flexurally loaded condition at the Treat Island, Maine, exposure station. The laboratory tests conducted on these beams consisted of examination and tensile testing of the steel prestressing (pretensioning) strands after removal from the beams and also tests to determine depths of carbonation and chloride penetration into the test beams. Conclusions: (1) The steel prestressing strands were heavily corroded due to spalling of the concrete and detachment of the protective epoxy end pads. The corrosion was heaviest at the ends of the strands, but it was also heavy in some areas of the midportion of the strand. (2) The corrosion of the strands was so severe that the eight strands tested in tension (four from each beam), none of the strands passed all of the ASTM tests for tensile strength or elongation under load. (3) The corrosion on the center wire of each strand was of the same intensity as that on the outer wires. (4) In areas of heavy corrosion of the strand, there was no cement paste stuck to the strands. (5) Results of tests to ascertain depth of carbonation indicated that carbonation was not a factor in the corrosion of the steel. (6) Results of tests to ascertain the degree of chloride contamination revealed that there were sufficient chlorides present to be a major cause of corrosion of the prestressing strands.

GRA

N77-12463# Army Materials and Mechanics Research Center, Watertown, Mass.

A SURVEY OF FRACTURE MECHANICS APPLICATIONS IN THE UNITED STATES Final Monograph Series

Thomas P. Rich, Peter G. Tracy, and David J. Cartwright Feb. 1976 35 p

(DA Proj. 1T1-61102-AH-42)

(AD-A024715; AMMRC-MS-76-1) Avail: NTIS HC A03/MF A01 CSCL 11/6

Results are presented in graphical form based upon data collected in a survey of fracture mechanics applications in the United States, which was conducted during the first half of 1975. The participants numbered 235 designers, engineers, and scientists from industry, Government, and university. The survey considered the field of fracture mechanics in its broadest sense, including all areas of design which involve the various aspects of fracture in solids. The questionnaire used in the survey is given in the Appendix.

GRA

N77-12464# Pennsylvania State Univ., University Park. Applied Research Lab.

VIBRATION AND SOUND RADIATION OF A PLATE Ph.D. Thesis

Robert J. Hannon 28 Jul. 1975 122 p refs

(Contract N00017-73-C-1418)

(AD-A024985; TM-75-201) Avail: NTIS HC A06/MF A01 CSCL 20/1

Because of their many vibratory resonances, plates are mechanically soft and their suspending structures have a considerable effect on their vibration and sound radiation. Experimental evaluation of acoustic properties of plates is therefore difficult. Plates of different shapes and dimensions were supported in such a way as to eliminate effects of the support on the vibration, and the velocity amplitudes due to point forces were recorded by phonography cartridge and microphones in the near sound field. The results show that the many vibratory modes generate hotspot on the plates. The attachment of ribs and supports disturbs the vibration field and leads to localized areas of increased sound radiation. Long wavelength acoustic holography was used to locate on the vibrating plates the sources of far-field sound. These regions were also investigated by recording the vibratory and nodal line patterns of the plates by a near-field microphone method. This combination of techniques has a unique capability to locate acoustic sources on vibrating structures.

Author (GRA)

N77-12465# Construction Engineering Research Lab. (Army), Champaign, Ill.

AN ANALYTICAL MODEL FOR UNIAXIAL CYCLIC INELASTIC BEHAVIOR OF REINFORCED CONCRETE Final Report

Sushil K. Sharma and Rabi K. Bhattacharyya May 1976 25 p refs

(AD-A024910; CERL-TR-M-180) Avail: NTIS HC A02/MF A01 CSCL 13/3

The report presents an analytical model for uniaxial cyclic inelastic behavior of reinforced concrete. The model was synthesized from the analytical models for plain concrete and reinforcing steel. The parameters of the models were derived from extensive experimental data taken from the literature. Cyclic experimental tests on plain concrete and steel involving large inelastic strains were simulated by the plain concrete and reinforcing steel models; the experimental and analytical results showed close agreement.

GRA

N77-12466# Southwest Research Inst., San Antonio, Tex.

METHODS OF PREDICTING BLAST LOADS INSIDE AND OUTSIDE SUPPRESSIVE STRUCTURES Technical Report, Jan. - Sep. 1974

W. E. Baker and P. S. Westine Nov. 1975 28 p refs

(Contract DAAD05-74-C-0751; DAAA05-75-C-0083)

(AD-A024906; EM-CR-76026; TR-5) Avail: NTIS HC A03/MF A01 CSCL 19/4

This report presents methods for predicting blast loads, quasi-static pressure rises, and venting times within suppressive structures. In addition, side-on pressures outside these vented structures are estimated. Data are presented in scaled form.

Author (GRA)

N77-12467# City Univ. of New York Research Foundation, N.Y.

SPHERE, A PROGRAM FOR COMPUTING BUCKLING LOADS OF SPHERICAL SHELLS UNDER UNIFORM PRESSURE Interim Report

Harry E. Rauch, Neal H. Jacobs, and Jonathan L. Marz 1975 65 p refs

(Grant AF-AFOSR-2063-71; AF Proj. 9749)

(AD-A025012; AFOSR-76-0553TR) Avail: NTIS HC A04/MF A01 CSCL 20/11

SPHERE is the PL/I, double precision, computer program used to implement the theory on 'Instability of thin-walled spherical structures under external pressure' by Harry E. Rauch in 'Contributions to Analysis,' Academic Press, New York 1974. It can be adapted quickly to solve any programmed system of simultaneous non-linear (algebraic or transcendental) equations in as many unknowns as the number of equations. SPHERE is based on the algorithm given in 'a globally converging secant method with applications to boundary value problems' by E. Polok in SIAM J. Num. Anal., 11 (1974), pp. 529-537. It is a

modified Newton-secant method combined with the method of local variations. Author (GRA)

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N77-12468* + National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 1 US CUMULATIVE CATALOG, 1975 - 1976
31 Jul. 1976 442 p
(NASA-TM-X-74298; GSFC/LU-76/013; NTISUB/B/138-76/013) Avail: NTIS HC A19 CSCL 05B

The LANDSAT 1 U.S. Cumulative Catalog lists U.S. imagery acquired by LANDSAT 1 which has been processed and input to the data files during the referenced year. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-12469* + National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 1 NON-US CUMULATIVE CATALOG, 1975 - 1976
31 Jul. 1976 209 p
(NASA-TM-X-74297; GSFC/LN-76/013; NTISUB/B/139-76/013) Avail: NTIS HC A10 CSCL 05B

The LANDSAT 1 non-U.S. Cumulative Catalog lists Non-U.S. imagery acquired by LANDSAT 1 which has been processed and input to the data files during the referenced year. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-12470* + New Mexico Univ., Albuquerque.
QUARTERLY LITERATURE REVIEW OF THE REMOTE SENSING OF NATURAL RESOURCES, THIRD QUARTER 1976
Oct. 1976 221 p
(NASA-CR-149163) Avail: NTIS For foreign requesters only. Domestic orders, Univ. of New Mexico, Tech. Application Center, Albuquerque HC $15.00 CSCL 08F

Abstracts related to remote sensing instrumentation and techniques, and to the remote sensing of natural resources are presented by the Technology Application Center at the University of New Mexico. Areas of interest included theory, general surveys, and miscellaneous studies; geology and hydrology; agriculture and forestry; marine sciences; and urban and land use. An alphabetically arranged Author/Key Word index is provided. Author

N77-12471 Oregon State Univ., Corvallis.
HYDRAULIC FUNCTIONS OF SOILS FROM PHYSICAL EXPERIMENTS AND THEIR APPLICATIONS Ph.D. Thesis
Chong-Guang Su 1976 143 p
Avail: Univ. Microfilms Order No. 76-23537

Based upon the Pearson type 8 distribution function, a general retention function which relates the saturation to the capillary pressure in disturbed soils was discovered. This function was shown to describe precisely the inhibition as well as the drainage branch of the retention curve. It is defined by four readily assessed parameters that either have physical significance themselves or may be used to determine some hydraulic properties of the soil. With the assumption that the Burdine integrals are adequate, a relative permeability function was derived through the substitution of the retention function for the integrands in the Burdine integrals. The permeability function is expressed in terms of the incomplete beta function ratio whose value may be conveniently found in some mathematical tables. A general pore-size distribution function of soils was obtained from the retention function. Dissert. Abstr.

N77-12472*# Ohio Dept. of Economic and Community Development, Columbus.
THE OHIO LAND ALLOCATION MODEL, PHASE 2
Oscar Fisch, Principal Investigator and Steven I. Gordon Jul. 1976 81 p refs ERTS
(Contract NAS5-22399)
(E77-10042; NASA-CR-149171) Avail: NTIS HC A05/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N77-12473*# Geological Survey, Menlo Park, Calif.
STUDIES OF THE INNER SHELF AND COASTAL SEDIMENTATION ENVIRONMENT OF THE BEAUFORT SEA FROM ERTS-A Final Report, 15 Jun. 1972 - 15 Oct. 1973
Erk Reimnitz, Principal Investigator, Peter W. Barnes, Larry J. Toimil, and Deborah Harden 15 Aug. 1976 104 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E77-10043; NASA-CR-149172) Avail: NTIS HC A06/MF A01 CSCL 08L

The author has identified the following significant results. Shearing periodically occurs between the westward moving pack ice (3 to 10 km/d) within the Pacific Gyre and the fast ice along the coast, forming major grounded shear and pressure ridges between the 10 to 40 m isobaths. Ridges occur in patterns conforming to known shoals. The zone of grounded ridges, called stamukhi zone, protects the inner shelf and coast from marine energy and pack ice forces. Relatively undeformed fast ice grows inshore of the stamukhi zone. The boundary is explained in terms of pack ice drift and major promontories and shoals. Intense ice gaging, highly disrupted sediments, and landward migration of shoals suggest that much of the available marine energy is expended on the sea floor within the stamukhi zone. Naleds (products of river icings) on the North Slope are more abundant east than west of the Colville River. Their location, growth, and decay were studied from LANDSAT imagery.

N77-12474*# Brevard County Planning Dept., Titusville, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 12 May - 11 Aug. 1976
John W. Hannah, Garland L. Thomas, Fernando Esparza, Principal Investigators, and James J. Millard (NASA. Kennedy Space Center) 11 Aug. 1976 35 p ref ERTS
(Contract NAS5-20907)
(E77-10044; NASA-CR-149180; BCPD-L2-6) Avail: NTIS HC A03/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N77-12475*# Ohio Dept. of Economic and Community Development, Columbus.
DEVELOPMENT OF A MULTI-DISCIPLINARY ERTS USER PROGRAM IN THE STATE OF OHIO Quarterly Progress Report
Paul E. Baldridge, Principal Investigator 10 Sep. 1976 5 p ref ERTS
(Contract NAS5-22399)
(E77-10045; NASA-CR-149181; QPR-5) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. A preliminary comparison of the land use maps derived from high altitude photography and imagery generated from land use CCT's shows considerable correlation of data. Most land use features are best identified on LANDSAT data taken over a full year, showing the effects of the four seasons. It appears that the most cost effective and timely way of providing land use data is to use LANDSAT data for identifying 75 to 90 percent of

land use categories, using temporal data. For surface mining, close examination of LANDSAT, Skylab, and aircraft data covering the same area where linears were found seems to indicate that the type of resolution characteristic of LANDSAT data results in a better definition of linears of one or more miles. Long line linears were found in the vicinity of known gas production areas in Ohio.

N77-12476*# ECON, Inc., Princeton, N.J.
SEASAT: A CANDIDATE OCEAN INDUSTRY ECONOMIC VERIFICATION EXPERIMENTS
B. P. Miller 16 Sep. 1976 88 p refs
(Contract NASw-2558)
(NASA-CR-149228; Rept-76-112-1) Avail: NTIS HC A05/MF A01 CSCL 05C

The economic benefits of an operational SEASAT system are discussed in the areas of marine transportation, offshore oil and natural gas exploration and development, ocean fishing, and Arctic operations. A description of the candidate economic verification experiments which could be performed with SEASAT-A is given. With the exception of the area of Arctic operations, experiments have been identified in each of the areas of ocean based activity that are expected to show an economic impact from the use of operational SEASAT data. Experiments have been identified in the areas of the offshore oil and natural gas industry, as well as ice monitoring and coastal zone applications. Emphasis has been placed on the identification and the development of those experiments which meet criteria for: (1) end user participation; (2) SEASAT-A data utility; (3) measurability of operational parameters to demonstrate economic effect; and (4) non-proprietary nature of results. Author

N77-12477*# ECON, Inc., Princeton, N.J.
SEASAT PROGRAMS OPTION ANALYSIS
Larrain Luckl 31 Aug. 1976 16 p
(Contract NASw-2558)
(NASA-CR-149229; Rept-76-112-2) Avail: NTIS HC A02/MF A01 CSCL 05A

A preliminary analysis of the costs of SEASAT follow-on options is presented. All the options assume the existence of SEASAT-A as currently defined in the SEASAT Economic Assessment. It is assumed that each option will continue through the year 2000 and approach operational system status in the 1983-1986 period, depending upon the sensor package selected. The launch vehicle assumed through 1983 is the Atlas Agena. After 1983, it is assumed SEASAT-A will switch to the use of the Space Shuttle. All cost estimates are 1976 dollars for fiscal year cost accounting, with no inflation rate included. Author

N77-12478*# ECON, Inc., Princeton, N.J.
A METHODOLOGY FOR THE EVALUATION OF PROGRAM COST AND SCHEDULE RISK FOR THE SEASAT PROGRAM
Philip Abram and Debra Myers 31 Aug. 1976 63 p
(Contract NASw-2558)
(NASA-CR-149230; Rept-76-113-1) Avail: NTIS HC A04/MF A01 CSCL 05A

An interactive computerized project management software package (RISKNET) is designed to analyze the effect of the risk involved in each specific activity on the results of the total SEASAT-A program. Both the time and the cost of each distinct activity can be modeled with an uncertainty interval so as to provide the project manager with not only the expected time and cost for the completion of the total program, but also with the expected range of costs corresponding to any desired level of significance. The nature of the SEASAT-A program is described. The capabilities of RISKNET and the implementation plan of a RISKNET analysis for the development of SEASAT-A are presented. Author

N77-12479*# Kanner (Leo) Associates, Redwood City, Calif.
USA REPORT PROPOSES: AN END TO FREE SATELLITE PICTURES
Eric Dyring Jul. 1976 16 p Transl. into ENGLISH from Forskaning och Framsted (Norway), v. 5, 1975 p 26-31
(Contract NASw-2790)
(NASA-TT-F-16732) Avail: NTIS HC A02/MF A01 CSCL 05B

A proposed organization of an all-powerful national satellite picture system in the United States of America and its impact on civilian use of satellite pictures are examined. L.S.

N77-12480*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE LARGE AREA CROP INVENTORY EXPERIMENT (LACIE)
R. B. MacDonald 1976 20 p refs Presented at 2d Ann. William T. Pecora Memorial Symp., Sioux Falls, S. Dak., 25-29 Oct. 1976
(NASA-TM-X-74225) Avail: NTIS HC A02/MF A01 CSCL 02C

A Large Area Crop Inventory Experiment (LACIE) was undertaken to prove out an economically important application of remote sensing from space. The experiment focused upon determination of wheat acreages in the U.S. Great Plains and upon the development and testing of yield models. The results and conclusions are presented. Author

N77-12481*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). PHASE 1: EVALUATION REPORT
May 1976 100 p refs
(NASA-TM-X-74226; LACIE-00418; JSC-11663) Avail: NTIS HC A05/MF A01 CSCL 02C

It appears that the Large Area Crop Inventory Experiment over the Great Plains, can with a reasonable expectation, be a satisfactory component of a 90/90 production estimator. The area estimator produced more accurate area estimates for the total winter wheat region than for the mixed spring and winter wheat region of the northern Great Plains. The accuracy does appear to degrade somewhat in regions of marginal agriculture where there are small fields and abundant confusion crops. However, it would appear that these regions tend also to be marginal with respect to wheat production and thus increased area estimation errors do not greatly influence the overall production estimation accuracy in the United States. The loss of segments resulting from cloud cover appears to be a random phenomenon that introduces no significant bias into the estimates. This loss does increase the variance of the estimates. Author

N77-12482*# Scientific Translation Service, Santa Barbara, Calif.
REPORT FROM SPACE
K. Lovstuhagen Washington NASA Nov. 1976 21 p Transl. into ENGLISH of "Rapport fra Rommet", a Magasinet, no. 40, 2 Oct. 1976 p 24-28, 30, 32
(Contract NASw-2791)
(NASA-TT-F-17504) Avail: NTIS HC A02/MF A01 CSCL 05B

A discussion is presented on satellite monitoring of Earth resources; the consequences of building a proposed ground support recording station in Norway are studied. L.S.

N77-12483*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LUMIS: LAND USE MANAGEMENT AND INFORMATION SYSTEMS; COORDINATE ORIENTED PROGRAM DOCUMENTATION
1 Nov. 1976 161 p ref
(NASA-CR-149165; JPL-SP-43-33) Avail: NTIS HC A08/MF A01 CSCL 08B

An integrated geographic information system to assist program managers and planning groups in metropolitan regions is presented. The series of computer software programs and procedures involved in data base construction uses the census DIME file and point-in-polygon architectures. The system is described in two parts: (1) instructions to operators with regard to digitizing and editing procedures, and (2) application of data base construction algorithms to achieve map registration, assure the topological integrity of polygon files, and tabulate land use acreages within administrative districts. Author

N77-12484# Bochum Observatory (West Germany). Inst. fuer Weltraumforschung.
REMOTE SENSING OF VARIATIONS OF SEA-ICE-SURFACES IN THE BARENTS-SEA FROM 1966 - 1975 BY MEANS OF SATELLITE DATA, AMONG OTHERS NOAA-VHRR

Heinz Kaminski 1976 32 p refs In GERMAN Presented at the 10th Intern. Polar Meeting, Zurich, 6-8 Apr. 1976
Avail: NTIS HC A03/MF A01

The sea ice dynamics were investigated from ESSA 2, 4, 6, 8, ITOS 1, NOAA 1, 3, 4 satellite infrared sensor measurements in April of the years 1966 to 1975. The free water surface was established and correlated with the average air and water temperature measured at the Vardoe, Kanin, Bjoernoya, Spitzbergen, and Ostrov Heisja weather stations. The free water surface is shown to have increased in the reference period, and the annual variations of the free water surface show a good correlation with the average water temperature of the Gulf North Cape stream and with the average April air temperature. ESA

N77-12485# Bochum Observatory (West Germany). Inst. fuer Weltraumforschung.
REMOTE SENSING OF GEOTHERMIC ACTIVITIES OF THE VOLCANOES AETNA, STROMBOLI AND VESUV BY MEANS OF INFRA-RED NOAA-VHRR-SATELLITE DATA
Heinz Kaminski 1976 17 p refs In GERMAN; ENGLISH summary Presented at the 16th Intern. Tech. Sci. Meeting on Space, Rome, 18-20 Mar. 1976
Avail: NTIS HC A02/MF A01

Geothermal investigations of volcanoes in southern Italy were made using high resolution (900 m ground resolution) NOAA 2, 3, and 4 remote sensing data. The thermal activity of the volcanoes is represented as delta F sub D, i.e., film density difference compared to the sea water film density in the period May to September 1974. The intensity variations of the three volcanoes are similar, which might mean that the volcanoes have the same magma source. ESA

N77-12486*# National Field Investigations Center, Denver, Colo.
AN APPLICATION OF ERTS TECHNOLOGY TO THE EVALUATION OF COAL STRIP MINING AND RECLAMATION IN THE NORTHERN GREAT PLAINS Final Report
Feb. 1975 120 p Sponsored by NASA and EPA
(NASA-CR-149208; PB-255590/2; EPA-330/3-75-001) Avail: NTIS HC A06/MF A01 CSCL 08G

The coal mines in Wyoming, Montana, North and South Dakota were studied using remote sensing data from Earth Resources Technology Satellite (ERTS). The study documented the size, shape and location of the actively mined area, untouched spoils piles, reclaimed or recontoured areas, newly vegetated areas and abandoned spoils piles within each of the 30 active, inactive or proposed coal mine sites. Land use, or classification, at each mine evaluated was defined by computer processing of ERTS data from digital magnetic tapes. (GRA)

N77-12487# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
AN ALGORITHM FOR THE ANALYSIS OF RECONNAISSANCE IMAGERY Final Report, Jun. 1972 - May 1975
Roger A. Gagnon Mar. 1976 26 p refs
(AF Proj. 7233)
(AD-A025964; AMRL-TR-75-60) Avail: NTIS HC A03/MF A01 CSCL 15/4

The algorithm is modular in design. The user only need substitute either his own subroutines or parameter values in order to test his hypotheses on the solution of the reconnaissance problems. As written, the algorithm uses the author's hypotheses on the human visual system approach to a reconnaissance problem. The resulting algorithm consists of a main program that defines the options chosen by the investigator and the search procedure to be used. Individual subroutines are used to perform each of several tasks that are dependent upon the reconnaissance problem at hand. The investigator need only specify the options desired. If he desires to investigate alternate approaches to those already programmed, he can substitute alternate subroutines. The algorithm is intended for use as a research vehicle that can be adapted to the specific needs of the researcher. Fruitful subroutines can then be incorporated for use by other users.
Author (GRA)

N77-12488# Stanford Research Inst., Menlo Park, Calif.
EFFECT OF SUN ANGLE, ATMOSPHERIC ATTENUATION, AND TURBULENCE ON MIRROR BEACONS FOR LANDSAT IMAGE CONTROL
William E. Evans Mar. 1976 72 p refs
(Contract DI-14-08-001-14897; SRI Proj. 4175-2)
(PB-255404/6; USGS-LI-76/001) Avail: NTIS HC A04/MF A01 CSCL 17H

Numerous experiments were conducted using mirrors for reflecting solar rays to mark LANDSAT images. After reviewing the results and calculating the theoretical and practical factors affecting the success of the operation, it was concluded that plane mirrors of from 1- to 4-sq ft of reflecting area can provide adequate marks on the image. Even though LANDSAT passes occur at a time when atmospheric thermal turbulence is relatively high, the strength of the return is adequate for spatial marking and possibly for spectral calibration purposes. Mirror pointing is the most critical factor affecting the results. An improved inexpensive mount was developed for use where it is desirable to excite an array of several pixels arranged in an identifiable pattern. GRA

N77-12489# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
EFFECTS OF RADIATION PENETRATION ON SNOWMELT RUNOFF HYDROGRAPHS
Samuel C. Colbeck Apr. 1976 17 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A025763; CRREL-76-11) Avail: NTIS HC A02/MF A01 CSCL 08/8

Water flow through the unsaturated portion of a snowpack is calculated using various assumptions about radiation penetration into the snow. The results show that for the purposes of hydrologic forecasting, it is sufficiently accurate to assume that all of the radiation absorption occurs at the surface. The error in the calculation of flow is largest for very shallow snowpacks, but this error is reduced by radiation absorption at the base of the snow and by the routing of meltwater through the saturated basal layer. GRA

N77-12490*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT US STANDARD CATALOG Monthly Progress Report, 1-31 Jul. 1976
31 Jul. 1976 112 p
(NASA-TM-X-74261; GSFC/LU-76/007) Avail: NTIS HC A06/MF A01 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles. Sections 4 and 5 cover LANDSAT-1 and LANDSAT-2 coverage, respectively. Author

N77-12491*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT US STANDARD CATALOG
31 Aug. 1976 129 p
(NASA-TM-X-74262; GSFC/LU-76/008; NTISUB/B/138-76/008) Avail: NTIS HC A07/MF A01 CSCL 05B

The U.S. Standard Catalog lists U.S. imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-12492*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT NON-US STANDARD CATALOG Monthly Progress Report, 1-31 Jul. 1976
31 Jul. 1976 126 p
(NASA-TM-X-74259; GSFC/LN-76/007) Avail: NTIS HC A07/MF A01 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing

Facility is published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles. Sections 4 and 5 cover LANDSAT-1 and LANDSAT-2 coverage, respectively. Author

N77-12493*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LANDSAT NON-US STANDARD CATALOG Monthly Progress Report, 1-31 Aug. 1976

31 Aug. 1976 117 p

(NASA-TM-X-74258; GSFC/LN-76/008) Avail: NTIS HC A06/MF A01 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska and Hawaii. The Non-U.S. Standard Catalog identifies all the remaining coverage. Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm. Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles. Sections 4 and 5 cover LANDSAT-1 and LANDSAT-2 coverage, respectively. Author

N77-12494# Geological Survey, Little Rock, Ark. Water Resources Div.

WATER RESOURCES DATA FOR ARKANSAS, WATER YEAR 1975 Water Data Report, 1 Oct. 1974 - 30 Sep. 1975

Jul. 1976 696 p refs Prepared in cooperation with Ark. Geol. Comm., Little Rock, Ark. State Highway Dept.,Little Rock, Ark. Div. of Soil and Water Resources, Little Rock

(PB-256671/9; USGS/WRD/HD-76/022; USGS/WDR/AR-75/1) Avail: NTIS HC A99/MF A01 CSCL 13B

Water resources data for the 1975 water year for Arkansas consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. The report contains discharge records for 72 gaging stations; stage only records for 1 gaging station; stage and contents for 1 gaging station; stage and contents for 13 lakes and reservoirs; water quality for 123 gaging stations, 62 partial-record flow stations, 8 lakes, and 21 wells; and water levels for 75 observation wells. Also included are 116 crest-stage partial-record stations. GRA

N77-12495# Geological Survey, Rolla, Mo. Water Resources Div.

WATER RESOURCES DATA FOR MISSOURI, WATER YEAR 1975 Water Data Report, 1 Oct. 1974 - 30 Sep. 1975

Aug. 1976 378 p refs Prepared in cooperation with Mo. Dept. of Nat. Resources, Jefferson City and Mo. State Highway Dept., Jefferson City Sponsored in part by EPA

(PB-256765/9; USGS/WRD/HD-76/031; USGS/WDR/MO-75/1) Avail: NTIS HC A17/MF A01 CSCL 13B

Water Resources data for the 1975 water year for Missouri consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs. This report contains discharge records for 138 gaging stations; stage and contents for 6 lakes and reservoirs, and water quality for 53 gaging stations. Also included are data for 103 crest stage partial record stations, 30 partial record water quality stations and 25 miscellaneous sampling sites. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating state and Federal agencies in Missouri. GRA

N77-12496# Geological Survey, Trenton, N.J. Water Resources Div.

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR, 1975 Annual Report, 1 Oct. 1974 - 30 Sep. 1975

Jun. 1976 494 p refs Sponsored in part by N. J. Dept. of Environ. Protection, Trenton and Corps of Engr., Washington, D. C.

(PB-256802/0; USGS/WRD/HD-76/020; USGS/WDR/NJ-75/1; Rept-1) Avail: NTIS HC A21/MF A01 CSCL 13B

Water resources data for the 1975 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water quality in wells and springs. Included are discharge records for 85 gaging stations; tide summaries for 11 stations; stage and contents for 31 lakes and reservoirs; water quality for 25 gaging stations, 87 partial- record flow stations, and 164 wells. Also included are 75 crest stage partial record stations and 58 low flow partial record stations. Additional water data collected at various sites, not part of the systematic data collection program are published as miscellaneous measurements. GRA

N77-12497# Geological Survey, Honolulu, Hawaii. Water Resources Div.

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1975 Water Data Report, 1 Oct. 1974 - 30 Sep. 1975

Mar. 1976 414 p Sponsored by Hawaii State Dept. of Land and Natural Resources and State Dept. of Transportation, Honolulu, Hawaii, Corps of Engr., Washington, D. C. and Trust Territory of the Pacific Islands, Saipan, Mariana Islands

(PB-256668/5; USGS/WRD/HD-76/021; USGS/WDR/HI-75/1) Avail: NTIS HC A18/MF A01 CSCL 13B

Water resources data for Hawaii and other Pacific Areas consist of records of stage, discharge, and water quality of streams; stage of a reservoir; and water levels and water quality in wells and springs. This report contains discharge records for 164 gaging stations; stage only record for 1 gaging station; water quality for 10 gaging stations, 56 partial-record flow stations and 113 wells; and water levels for 8 observation wells. Also included are 107 crest stage partial record stations and 103 low flow partial record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. GRA

N77-12498# Control Data Corp., Minneapolis, Minn. Digital Image Systems Div.

DIGITAL ORTHOPHOTO STUDY ADD-ON Final Technical Report, Jan. - Feb. 1976

D. J. Panton Griffiss AFB, N. Y. RADC May 1976 37 p

(Contract F30602-76-C-0108; AF Proj. 5569) (AD-A025690; RADC-TR-76-121) Avail: NTIS HC A03/MF A01 CSCL 14/5

Digital image processing techniques for orthophoto generation were developed and investigated in a previous study entitled Digital Orthophoto Study. The primary concern of this Add-On is the application of these techniques to a large image area. Two frames of aerial photography were digitized using different devices. The slower device did produce an image whose orthophoto was more accurate. It was found that the process referred to as interior orientation is a crucial factor affecting the accuracy of the final orthophoto as well as the precision with which separate orthophoto segments can be mosaicked together. Author (GRA)

N77-12499# Denver Research Inst., Colo. Metallurgical and Materials Science Div.

CHARACTERIZATION STUDY OF DOMESTIC NICKELIFEROUS LATERITES BY ELECTRON OPTICAL AND X-RAY TECHNIQUES

Dhanesh Chandra and Clayton O. Ruud Apr. 1976 64 p refs (Contract DI-BM-GO-254028)

(PB-256699/0; BM-OFR-75-76) Avail: NTIS HC A04/MF A01 CSCL 08I

X-ray diffraction, scanning electron microscopy, and conventional mineralogical investigations to determine elemental distribution, particle shape and size, and mineral identity of the Eight Dollar Mountain and Pine Flats ores are described. The nickel was found to be mainly associated with a cryptocrystalline geothite, while the cobalt and minor amounts of nickel are distributed in the manganese minerals. Low concentrates of

hematite and trace amounts of magnetite and chromite are present in the ores. Major silicate minerals present are antigonite serpentine, chlorite, talc, and quartz. Nickel, aluminum, and chromium are incorporated in the geothite lattice. GRA

N77-12500# Federal Energy Administration, Washington, D.C.
A SURVEY OF SALT DEPOSITS AND SALT CAVERNS: THEIR RELEVANCE TO THE STRATEGIC PETROLEUM RESERVE
Charles J. Jirik and Louis K. Weaver Jul. 1976 72 p refs
(PB-255948/2; FEA/S-76/310) Avail: NTIS HC A04/MF A01 CSCL 08I

Rock salt has been mined in the United States by underground mining since 1867 and by large scale water-leaching methods since shortly after World War II. Since the 1940's, underground caverns have become very useful for storing liquefied petroleum gases and natural gas. Of all underground storage capacity in reservoirs of all types in the United States, about 93 percent is in salt. To evaluate the potential of any salt deposit as a storage site, information regarding all major activities, past and present, on each deposit was determined. Those activities are summarized as they pertain to LPG storage, salt production, and sulfur production operations on each appropriate site. GRA

N77-12501# Battelle Columbus Labs., Ohio.
METALS MINING AND MILLING PROCESS PROFILES WITH ENVIRONMENTAL ASPECTS Final Report, Aug. 1975 - May 1976
R. J. Nerkervis and J. B. Hallowell Jun. 1976 318 p refs
(Contract EPA-68-02-1323)
(PB-256394/8; EPA-600/2-76-167) Avail: NTIS HC A14/MF A01 CSCL 08/1

The environmental aspects of metals mining and milling (concentration) operations in the U.S. are discussed. The metals include Al, Sb, Be, Cu, Au, Fe, Pb, Zn, Hg, Mo, Ni, Pt, the rare earth metals, Ag, Ti, W, U, and V. The types of environmental impacts associated with operations from mining through production of concentrate are described. The number and locations of plants, the names of producing companies, production levels, and other characteristics of the industry are presented. Each unit process is described in terms of function, input materials, operating conditions, utilities and energy use, and waste streams. GRA

N77-12502# American Inst. of Mining, Metallurgical, and Petroleum Engineers, Inc., Washington, D. C.
PROCEEDINGS OF THE MINERAL ECONOMICS SYMPOSIUM: WINNING THE HIGH STAKES AT THE CRITICAL COMMODITY GAME
K. L. Wang, ed. and B. W. Klein, ed. 11 Nov. 1975 104 p Symp. held at Arlington, Va., 11 Nov. 1975
(PB-255607/4; NSF/RA-760162) Avail: NTIS HC A06/MF A01 CSCL 08I

The proceedings of the First Mineral Economics Symposium are reported. Of the 170 (approximately) people in attendance, five departments of Government and 13 Government agencies are represented as well as attendees from industry, trade associations, academia, nonprofit research organizations and foundations, and independent consultants. A forum for exchanging views on commodity agreements and cartels and the related economic stockpile issue was provided. GRA

N77-12503# Army Engineer Topographic Labs., Fort Belvoir, Va.
A NEW PHOTOGRAMMETRIC COMPARATOR DESIGN
Andrew J. Bondurant, Jr. 1976 12 p refs
(AD-A025977) Avail: NTIS HC A02/MF A01 CSCL 08/2

This paper describes a comparator believed to be unique in many respects. The laser interferometer permits a lightweight, compact design requiring less operating space and making the instrument very portable. The cost of the instrument is relatively low and the accuracy exceeds that required for most photogrammetric applications. The inclusion of an on-line programmable calculator enables relatively easy calibration of the system and permits near real time computations of the coordinates being measured. With additional programming, the instrument can perform other functions, such as the near real time computation of ground point positions, and any other photogrammetrically related task involving measurements and subsequent computations. The techniques employed in this new instrument represent significant progress in the design of photogrammetric comparators. They also hold great promise for a wide variety of applications in other similar devices. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N77-12504 Pennsylvania Univ., Philadelphia.
PLANNING MODELS FOR THE ASSESSMENT OF ADVANCED ENERGY STORAGE SYSTEMS Ph.D. Thesis
Fred Shuen Tak Ma 1976 181 p
Avail: Univ. Microfilms Order No. 76-22731

Two alternative approaches are identified: a system storage which can be charged electrically by any conventional power plant of the system; and a solar storage which can only store non-electrical energy extracted from a renewable source (e.g., by solar thermal conversion). In both approaches, the storage is included as a limited source of energy generation in a power system. They are structured as optimal control formulations which include important basic technological parameters. The optimization problem is then solved using dynamic programming. The feasibility of a candidate configuration of each advanced technology is compared with those of advanced designs of gas turbines and combined cycles. Results of this study indicate that, based on moderately projected cost and life span estimates, the specific storage systems are more expensive than gas turbines and combined cycles. Dissert. Abstr.

N77-12505*+ National Aeronautics and Space Administration, Washington, D.C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jul. 1976 165 p refs
(NASA-SP-7043(10)) Avail: NTIS HC $4.00 CSCL 10B

This bibliography lists 337 reports, articles, and other documents introduced into the NASA scientific and technical information system from January 1, 1975 through March 31, 1975. Author

N77-12506# California Univ., Livermore. Lawrence Livermore Lab.
FLAT-PLATE SOLAR COLLECTOR HANDBOOK. A SURVEY OF PRINCIPLES, TECHNICAL DATA AND EVALUATION RESULTS
Herbert W. Newkirk, comp. 29 Mar. 1976 95 p refs
(Contract W-7405-eng-48)
(UCID-17086) Avail: NTIS HC A05/MF A01

Principles of flat plate solar absorption are discussed. Medium temperature collectors produced and sold by thirteen foreign and domestic manufacturers are evaluated. Criteria for selection are: intention by the manufacturer that the equipment be used only for heating and cooling buildings and for domestic hot water heating, and evaluation of the collector by NASA using a solar simulator as a basis for collector selection and performance prediction. Data presented in this handbook were abstracted from information received from the participating companies and from NASA reports. Author

N77-12507*# Alabama Univ., Huntsville. Center for Environmental and Energy Studies.
LISTING OF SOLAR RADIATION MEASURING EQUIPMENT AND GLOSSARY
E. A. Carter, S. A. Greenbaum, and A. M. Patel Jul. 1976 53 p refs Sponsored in part by ERDA

(Contract NAS8-31293)
(NASA-CR-150064; ERDA/NASA-31293-76/3) Avail: NTIS HC A04/MF A01 CSCL 10A

An attempt is made to list and provide all available information about solar radiation measuring equipment which are being manufactured and are available on the market. The list is in tabular form and includes sensor type, response time, cost data and comments for each model. A cost code is included which shows ranges only. Author

N77-12508*# Kanner (Leo) Associates, Redwood City, Calif.
ENERGY STORAGE SYSTEMS: BEHAVIOR OF SD 15K HERMETICALLY SEALED NiCd CELLS; DEVELOPMENT TRENDS
D. Harden Washington NASA Sep. 1976 17 p Transl. into ENGLISH of report from German conf. Presented at DGLR Seminar on Status and Develop. Trends in Energy Prepn. Systems for Space Vehicles, Porz-Wahn, West Germany, 16 Jun. 1976 p 1-18
(Contract NASw-2790)
(NASA-TT-F-16761) Avail: NTIS HC A02/MF A01 CSCL 10C

Test data on the SD 15K NiCd cell are reported and analyzed. Its characteristics are compared with those of the NiH2 systems; it is concluded that the former is superior at present. Author

N77-12509*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
WIND POWER PREDICTION MODELS
R. Levy and H. McGinness 15 Nov. 1976 61 p refs
(Contract NAS7-100)
(NASA-CR-149235; JPL-TM-33-802) Avail: NTIS HC A04/MF A01 CSCL 10A

Investigations were performed to predict the power available from the wind at the Goldstone, California, antenna site complex. The background for power prediction was derived from a statistical evaluation of available wind speed data records at this location and at nearby locations similarly situated within the Mojave desert. In addition to a model for power prediction over relatively long periods of time, an interim simulation model that produces sample wind speeds is described. The interim model furnishes uncorrelated sample speeds at hourly intervals that reproduce the statistical wind distribution at Goldstone. A stochastic simulation model to provide speed samples representative of both the statistical speed distributions and correlations is also discussed. Author

N77-12510*# Dynatech R/D Co., Cambridge, Mass.
THERMAL ENERGY STORAGE MATERIAL THERMOPHYSICAL PROPERTY MEASUREMENT AND HEAT TRANSFER IMPACT
R. P. Tye, J. G. Bourne, and A. O. Destarlais 11 Aug. 1976 98 p refs
(Contract NAS3-19716)
(NASA-CR-135098; Rept-1503) Avail: NTIS HC A05/MF A01 CSCL 10A

The thermophysical properties of salts having potential for thermal energy storage to provide peaking energy in conventional electric utility power plants were investigated. The power plants studied were the pressurized water reactor, boiling water reactor, supercritical steam reactor, and high temperature gas reactor. The salts considered were LiNO3, 63LiOH/37 LiCl eutectic, LiOH, and Na2B4O7. The thermal conductivity, specific heat (including latent heat of fusion), and density of each salt were measured for a temperature range of at least + or - 100 K of the measured melting point. Measurements were made with both reagent and commercial grades of each salt. Author

N77-12511*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD AND APPARATUS FOR RECONDITIONING NICKEL-CADMIUM BATTERIES Patent Application
Robert E. Kapustka, inventor (to NASA) Filed 24 Nov. 1976 13 p
(NASA-Case-MFS-23270-1; US-Patent-Appl-SN-744573) Avail: NTIS HC A02/MF A01 CSCL 10C

A method and apparatus for reconditioning batteries are described which can be applied in reconditioning nickel-cadmium batteries in outer space. A DC-DC converter monitors the output of each cell of a Ni-Cd battery through the use of N low voltage outputs connected in parallel to the converter. The open circuit output voltage of each of these outputs is less than the battery cell voltage. Because each output consists of two rectifier diodes 28, 30, the cell voltage will normally reverse bias (turn off) the two diodes in each output. If, however, the cell voltage falls below the voltage of its corresponding output, the voltage from a transformer winding in the converter would forward bias the diodes and would assume the load. This would prevent the cell from reaching zero voltage and reversing its polarity during normal operation or reconditioning. NASA

N77-12512*# South Carolina Univ., Columbia. Coll. of Engineering.
WEB-DENDRITIC RIBBON GROWTH Annual Report, 1 Oct. 1975 - 31 Sep. 1976
R. B. Hilborn, Jr. and J. W. Faust, Jr. 31 Sep. 1976 82 p Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954344)
(NASA-CR-149237; USC-A-1; ERDA/JPL-954344-76/3) Avail: NTIS HC A05/MF A01 CSCL 10A

A web furnace was constructed for pulling dendritic-web samples. The effect of changes in the furnace thermal geometry on the growth of dendritic-web was studied. Several attempts were made to grow primitive dendrites for use as the dendritic seed crystals for web growth and to determine the optimum twin spacing in the dendritic seed crystal for web growth. Mathematical models and computer programs were used to determine the thermal geometries in the susceptor, crucible melt, meniscus, and web. Several geometries were determined for particular furnace geometries and growth conditions. The information obtained was used in conjunction with results from the experimental growth investigations in order to achieve proper conditions for sustained pulling of two dendrite web ribbons. In addition, the facilities for obtaining the following data were constructed: twin spacing, dislocation density, web geometry, resistivity, majority charge carrier type, and minority carrier lifetime. Author

N77-12513*# Honeywell Corporate Research Center, Bloomington, Minn.
DIP COATING PROCESS: SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE-AREA SILICON SHEET TASK OF THE LOW-COST SILICON SOLAR ARRAY PROJECT Annual Report
J. D. Heaps, R. B. Maciolek, J. D. Zook, W. B. Harrison, M. W. Scott, G. Hendrickson, H. A. Wolner, L. D. Nelson, T. L. Schuller, and A. A. Peterson 28 Sep. 1976 97 p refs Prepared for JPL
(Contract NAS7-100)
(NASA-CR-149242; ERDA/JPL-954356-76/2; AR-1) Avail: NTIS HC A05/MF A01 CSCL 10A

The technical and economic feasibility of producing solar cell quality sheet silicon by dip-coating one surface of carbonized ceramic substrates with a thin layer of large grain polycrystalline silicon was investigated. The dip-coating methods studied were directed toward a minimum cost process with the ultimate objective of producing solar cells with a conversion efficiency of 10% or greater. The technique shows excellent promise for low cost, labor-saving, scale-up potentialities and would provide an end product of sheet silicon with a rigid and strong supportive backing. An experimental dip-coating facility was designed and constructed, several substrates were successfully dip-coated with areas as large as 25 sq cm and thicknesses of 12 micron to 250 micron. There appears to be no serious limitation on the area of a substrate that could be coated. Of the various substrate materials dip-coated, mullite appears to best satisfy the requirement of the program. An inexpensive process was developed for producing mullite in the desired geometry. Author

N77-12514*# Union Carbide Corp., Sistersville, W. Va.
LOW COST SILICON SOLAR ARRAY PROJECT. TASK 1: ESTABLISHMENT OF THE FEASIBILITY OF A PROCESS CAPABLE OF LOW COST, HIGH VOLUME PRODUCTION OF SILANE, SiH4 Annual Report
W. C. Breneman and J. Y. P. Mui 1 Oct. 1976 57 p refs Prepared for JPL Sponsored by ERDA
(Contracts NAS7-100; JPL-954334)

(NASA-CR-149238; ERDA/JPL-954334-76/3) Avail: NTIS HC A04/MF A01 CSCL 10A

The kinetics of the redistribution of dichlorosilane and trichlorosilane vapor over a tertiary amine ion exchange resin catalyst were investigated. The hydrogenation of SiCl4 to form HSiCl3 and the direct synthesis of H2SiCl2 from HCl gas and metallurgical silicon metal were also studied. The purification of SiH4 using activated carbon adsorbent was studied along with a process for storing SiH4 absorbed on carbon. The latter makes possible a higher volumetric efficiency than compressed gas storage. A mini-plant designed to produce ten pounds per day of SiH4 is described. Author

N77-12515*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
LARGE AREA SILICON SHEET BY EFG Annual Progress Report, 29 Oct. 1975 - 30 Sep. 1976
A. D. Morrison, K. V. Ravi, C. V. Hari Rao, T. Surek, D. F. Bliss, L. C. Garone, and R. W. Hogencamp 15 Sep. 1976 114 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954355)
(C-500; ERDA/JPL-954355-76/11) Avail: NTIS HC A06/MF A01 CSCL 10A

Progress in a program to produce high speed, thin, wide silicon sheets for fabricating 10% efficient solar cells is reported. An EFG ribbon growth system was used to perform growth rate and ribbon thickness experiments. A new, wide ribbon growth system was developed. A theoretical study of stresses in ribbons was also conducted. The EFG ribbons were observed to exhibit a characteristic defect structure which is orientation dependent in the early stages of growth. Author

N77-12516*# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
CHEMICAL VAPOR DEPOSITION GROWTH Annual Report
R. P. Ruth, H. M. Manasevit, R. E. Johnson, J. L. Kenty, L. A. Moudy, W. I. Simpson, and J. J. Yang 1 Oct. 1976 163 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954372)
(NASA-CR-149233; C76-320.3/501;
ERDA/JPL-954372-76/3) Avail: NTIS HC A08/MF A01 CSCL 10A

A laboratory type CVD reactor system with a vertical deposition chamber and sample pedestal heated by an external RF coil has been extensively modified by installation of mass flow controllers, automatic process sequence timers, and special bellows-sealed air-operated valves for overall improved performance. Various film characterization procedures, including classical metallography, SEM analyses, X ray diffraction analyses, surface profilometry, and electrical measurements (resistivity, carrier concentration, mobility, spreading resistance profiles, and minority-carrier lifetime by the C-V-t method) area used to correlate Si sheet properties with CVD parameters and substrate properties. Evaluation procedures and measurements are given. Experimental solar cell structures were made both in epitaxial Si sheet (on sapphire substrates) and in polycrystalline material on alumina substrates, the former to provide an indication of what might be an upper limit on performance of the latter. Preliminary results are given, as obtained in cell structures not specially designed to allow for the unique properties of the sheet material, and fabricated in material known to be far from optimum for photovoltaic performance. Low power conversion efficiencies have been obtained in the epitaxial as well as the polycrystalline Si sheet. Author

N77-12517*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE-TO-EARTH POWER TRANSMISSION SYSTEM
Grady H. Stevens and Richard Schuh Nov. 1976 143 p refs
(NASA-TM-X-73489; E-8885) Avail: NTIS HC A07/MF A01 CSCL 10A

A preliminary analysis was conducted to establish the requirements of a space-to-earth microwave power transmission system. The need for accurate phase control on the transmitter was established and methods for assessing the impact of power density and thermal constraints on system performance were demonstrated. Potential radio frequency interference was considered. The sensitivity of transmission system scale to variations in power source, transportation and orbital fabrication and assembly costs was also determined. Author

N77-12518*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASURED PERFORMANCE OF A 3 TON LiBr ABSORPTION WATER CHILLER AND ITS EFFECT ON COOLING SYSTEM OPERATION
David Namkoong 1976 10 p Presented at the Intern. Solar Energy Meeting, Winnipeg, Can., 15-20 Aug. 1976
(NASA-TM-X-73496; E-8894) Avail: NTIS HC A02/MF A01 CSCL 10A

A three ton lithium bromide absorption water chiller was tested for a number of conditions involving hot water input, chilled water, and the cooling water. The primary influences on chiller capacity were the hot water inlet temperature and the cooling water inlet temperature. One combination of these two parameters extended the output to as much as 125% of design capacity, but no combination could lower the capacity to below 60% of design. A cooling system was conceptually designed so that it could provide several modes of operation. Such flexibility is needed for any solar cooling system to be able to accommodate the varying solar energy collection and the varying building demand. It was concluded that a three-ton absorption water chiller with the kind of performance that was measured can be incorporated into a cooling system such as that proposed, to provide efficient cooling over the specified ranges of operating conditions. Author

N77-12519*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF SILICON SOLAR CELL TECHNOLOGY
Henry W. Brandhorst, Jr. 1976 17 p refs Presented at the 2d Intern. Conf. on Solid State Devices, Tokyo, 1-3 Sep. 1976; Sponsored by Japan. Soc. of Appl. Phys.
(NASA-TM-X-73531; E-8956) Avail: NTIS HC A02/MF A01 CSCL 10A

Major progress in solar cell technology leading to increased efficiency has occurred since 1970. Technical approaches leading to this increased output include surface texturing, improved antireflection coatings, reduced grid pattern area coverage, shallow junctions and back surface fields. The status of these developments and their incorporation into cell production is discussed. Future research and technology trends leading to further efficiency increases and substantial cost reductions are described. Author

N77-12520*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OUTDOOR PERFORMANCE RESULTS FOR NBS ROUND ROBIN COLLECTOR NO. 1
Dean R. Miller Nov. 1976 10 p refs
(NASA-TM-X-73547; E-8983) Avail: NTIS HC A02/MF A01 CSCL 10A

The efficiency of a PPG flat-plate solar collector was evaluated utilizing an outdoor solar collector test facility at the NASA-Lewis Research Center, as part of the National Bureau of Standards 'round robin' collector test program. The correlation equation for collector thermal efficiency Eta curve fit of the data was: Eta = 0.666 - 1.003(Btu/hr-sq ft-F) Theta, where the parameter Theta is the difference between the average fluid temperature and the ambient temperature, all divided by the total flux impinging on the collector. Author

N77-12521*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEMPERATURE DISTRIBUTION OF A HOT WATER STORAGE TANK IN A SIMULATED SOLAR HEATING AND COOLING SYSTEM
David Namkoong Nov. 1976 17 p refs
(NASA-TM-X-73549; E-8985) Avail: NTIS HC A02/MF A01 CSCL 10A

A 2,300-liter hot water storage tank was studied under conditions simulating a solar heating and cooling system. The initial condition of the tank, ranging from 37 C at the bottom to 94 C at the top, represented a condition midway through the start-up period of the system. During the five-day test period, the water in the tank gradually rose in temperature but in a manner that diminished its temperature stratification. Stratification

was found not to be an important factor in the operation of the particular solar system studied. Author

N77-12522*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE REDOX FLOW SYSTEM FOR SOLAR PHOTOVOLTAIC ENERGY STORAGE
Patricia ODonnell and Randall F. Gahn 1976 9 p refs Presented at the Twelfth Photovoltaic Specialists Conf. sponsored by the Inst. of Elec. and Electron. Eng., Baton Rouge, La., 15-18 Nov. 1976
(NASA-TM-X-73562; E-9006) Avail: NTIS HC A02/MF A01 CSCL 10A

A new method of storage was applied to a solar photovoltaic system. The storage method is a redox flow system which utilizes the oxidation-reduction capability of two soluble electrochemical redox couples for its storage capacity. The particular variant described separates the charging and discharging function of the system such that the electrochemical couples are simultaneously charged and discharged in separate parts of the system. The solar array had 12 solar cells; wired in order to give a range of voltages and currents. The system stored the solar energy so that a load could be run continually day and night. The main advantages of the redox system are that it can accept a charge in the low voltage range and produce a relatively constant output regardless of solar activity. Author

N77-12523*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF EPITAXIAL DRIFT FIELD N ON P SILICON SOLAR CELLS
Cosmo R. Baraona and Henry W. Brandhorst, Jr. 1976 10 p Presented at the Twelfth Photovoltaic Specialists Conf. sponsored by the Inst. of Elec. and Electron. Eng., Baton Rouge, La., 15-18 Nov. 1976
(NASA-TM-X-73563; E-9007) Avail: NTIS HC A02/MF A01 CSCL 10A

The performance of epitaxial drift field silicon solar cell structures having a variety of impurity profiles was calculated. These structures consist of a uniformly doped P-type substrate layer, and a P-type epitaxial drift field layer with a variety of field strengths. Several N-layer structures were modeled. A four layer solar cell model was used to calculate efficiency, open circuit voltage and short circuit current. The effect on performance of layer thickness, doping level, and diffusion length was determined. The results show that peak initial efficiency of 18.1% occurs for a drift field thickness of about 30 micron with the doping rising from 10 to the 17th power atoms/cu cm at the edge of the depletion region to 10 to the 18th power atoms/cu cm in the substrate. Stronger drift fields (narrow field regions) allowed very high performance (17% efficiency) even after irradiation to 3x10 to the 14th power 1 MeV electrons/sq cm. Author

N77-12524*# Battelle Columbus Labs., Ohio.
REVIEW OF WORLD EXPERIENCE AND PROPERTIES OF MATERIALS FOR ENCAPSULATION OF TERRESTRIAL PHOTOVOLTAIC ARRAYS Final Report
D. C. Carmichael, G. B. Gaines, F. A. Sliemers, C. W. Kistler, and R. D. Igou 21 Jul. 1976 194 p refs Prepared for JPL Sponsored in part by ERDA
(Contracts NAS7-100; JPL-954328)
(NASA-CR-149215; ERDA/JPL-954328-76/4) Avail: NTIS HC A09/MF A01 CSCL 10A

Published and unpublished information relating to encapsulation systems and materials properties was collected by searching the literature and appropriate data bases (over 1,300 documents were selected and reviewed) and by personal contacts including site and company visits. A data tabulation summarizing world experience with terrestrial photovoltaic arrays (50 installations) is presented in the report. Based on criteria of properties, processability, availability, and cost, candidate materials were identified which have potential for use in encapsulation systems for arrays with a lifetime of over 20 years high reliability, an efficiency greater than 10 percent, a total price less than $500/kW, and a production capacity of 500,000 kW/yr. The recommended materials (all commercially available) include, depending upon the device design, various borosilicate and soda-lime glasses and numerous polymerics suitable for specific encapsulation system functions. Author

N77-12525# California Univ., Livermore. Lawrence Livermore Lab.
CALIFORNIA ENERGY OUTLOOK
E. Behrin and R. L. Cooper 6 Feb. 1976 49 p refs
(Contract W-7405-eng-48)
(UCRL-5196-Rev-1) Avail: NTIS HC $4.00

Projections are made for primary energy sources and energy demands in secondary and end-use markets in California. Fuel conservation, particularly in transportation, and increased supplies of oil and gas through the expected deregulation of oil and gas prices, as well as state imports of Alaskan oil, will sustain the California economy through 1985 without major increases in foreign imports. The resumption of offshore drilling in the Santa Barbara channel, exploitation of Elk Hills reserves, and the completion of the Alaska oil and gas pipelines are major factors in enhancing energy supplies in California through 1985. For the period 1985 to 2000 new energy technologies must be developed to prevent a substantial deterioration in the standard of living due to rapidly escalating energy costs and/or increased reliance on uncertain foreign sources. Author (ERA)

N77-12526# Ernst and Ernst, Washington, D.C.
REVIEW OF ENERGY FORECASTING METHODOLOGIES AND ASSUMPTIONS Final Report
Jun. 1976 351 p refs
(Contract DI-14-03-6101N)
(PB-255170/3) Avail: NTIS HC A16/MF A01 CSCL 10A

A systematic identification and description of energy forecasting methodologies used both within and outside of the Pacific Northwest are reported. Identification and comparative discussion of basic socioeconomic and other assumptions used in such forecasts, including discussions of how each varies, why variances occur, the potential effects of the variations on forecasting results, and reasons for including or excluding specific assumptions in the different forecast methodologies were described. A comparative discussion of interrelationships between electric energy forecasts, other energy forecasts, and non-energy forecasts presently in use in the Pacific Northwest are discussed. GRA

N77-12527# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
NET ENERGY FROM NUCLEAR POWER
Ralph M. Rotty, A. M. Perry, and David B. Reister May 1976 118 p refs Sponsored by FEA
(PB-254059/9; IEA-75-3; FEA/B-76/702) Avail: NTIS HC A06/MF A01 CSCL 18E

An analysis of net energy from nuclear power plants is dependent on a large number of variables and assumptions. The energy requirements are reported as they relate to reactor type, concentration of uranium in the ore, enrichment tails assay (the operating mode of enrichment plants), and possible recycle of uranium and plutonium. GRA

N77-12528# Stanford Research Inst., Menlo Park, Calif.
COSTS OF ALTERNATIVE SOURCES OF ELECTRICITY Final Report
Jeffrey G. Witwer Jul. 1976 64 p refs
(Contract DI-14-03-6108N; SRI Proj. 4963-100)
(PB-255765/0) Avail: NTIS HC A04/MF A01 CSCL 10B

Interest in alternative sources of electricity has been increasing in the hope of reducing future cost increases and reducing environmental impacts of energy production. This is a study of the costs of the following alternative sources of electrical energy: solar thermal, solar photovoltaic, wind, magnetohydrodynamics (MHD), fusion, agricultural residues, geothermal energy and municipal solid waste. GRA

N77-12529# UOP, Inc., Des Plaines, Ill.
OPTIMIZATION OF PT-DOPED KOCITE (TRADEMARK) ELECTRODES IN H3 PO4 FUEL CELLS Interim Progress Report, Sep. 1975 - Feb. 1976
L. B. Welsh, R. W. Leyerle, and G. L. Hervert Mar. 1976 53 p refs
(Contract DAAG53-76-C-0014; DA Proj. 1G7-62708-AH-67) (AD-A025326; IPR-1) Avail: NTIS HC A04/MF A01 CSCL 10/1

The use of UOP Pt-doped Kocite (Trademark) materials as low cost air and/or fuel electrocatalysts in phosphoric acid electrolyte fuel cells is being optimized. Kocite materials are composite structures consisting of pyropolymers chemically bonded to refractory substrates. Fuel cell electrodes are fabricated from these materials and tested as anodes or cathodes in model fuel cells with Teflon bonded Pt black electrodes as counter electrodes. Kocite materials are currently being produced in 200-400 gram quantities using two types of high surface area aluminas. Lifetime testing of Kocite electrodes as cathodes indicates no catalyst deterioration occurs for periods in excess of 500 hours for temperatures from 140 to 180 C. Both the thickness and density of the catalyst layer have been varied as part of the program to optimize the electrode structure. Preliminary results indicate little change in performance with catalyst layer density, but suggest that an improved performance may be obtainable with a thinner catalyst layer. GRA

N77-12530# Federal Energy Administration, Washington, D.C. Office of Oil and Gas.
CRUDE OIL SUPPLY ALTERNATIVES FOR THE NORTHERN TIER STATES
Aug. 1976 79 p
(PB-255991/2; FEA/G-76/350) Avail: NTIS HC A05/MF A01 CSCL 21D

The feasibility, cost, and potential environmental, social, and economic impacts are assessed for various alternate crude oil supply sources and transportation systems for Canada, Washington, Montana, Wisconsin, North Dakota, Minnesota, and Michigan. The historical current, and projected Canadian actions with regard to crude oil exports are described. The petroleum supply structure for crude oil and finished products affecting the Northern Tier are analyzed. Demand forecasts for the U.S. and for each of the six states are projected. Short-term supply solutions for the Northern Tier states are discussed. GRA

N77-12531# Bonner and Moore Associates, Inc., Houston, Tex.
CRUDE SUPPLY ALTERNATIVES FOR THE NORTHERN TIER STATES. VOLUME 1: EXECUTIVE SUMMARY
24 Jul. 1976 42 p
(Contract FEA-CR-05-60593-00)
(PB-255992/0; RAH-070A-Vol-1; FEA/G-76/358) Avail: NTIS HC A03/MF A01 CSCL 21D

Major conclusions drawn from an analysis of various alternatives for supply of crude oil and petroleum products to the Northern Tier States are presented. GRA

N77-12532# Bonner and Moore Associates, Inc., Houston, Tex.
CRUDE SUPPLY ALTERNATIVES FOR THE NORTHERN TIER STATES. VOLUME 2: TECHNICAL REPORT
25 Jul. 1976 447 p refs
(Contract FEA-CR-05-60593-00)
(PB-255993/8; RAH-070-Vol-2; FEA/G-76/359) Avail: NTIS HC A19/MF A01 CSCL 21D
For abstract, see N77-12531

N77-12533# Stanford Research Inst., Menlo Park, Calif.
IMPACTS OF SYNTHETIC LIQUID FUEL DEVELOPMENT. AUTOMOTIVE MARKET. VOLUME 1: SUMMARY Final Report
Edward M. Dickson, Robert V. Steele, Evan E. Hughes, Barry L. Walton, and R. Allen Zink Jun. 1976 117 p
(Contract EPA-68-03-2016)
(PB-255994/6; SRI-EGU-3505-UR-1-Vol-1; EPA-600/7-76-004-a) Avail: NTIS HC A06/MF A01 CSCL 21D

The impacts of the development of synthetic liquid fuels from coal and oil shale are assessed. The fuels considered are synthetic crude oils from coal and oil shale and methanol from coal. Key issues examined in detail are the technology and all of its resource requirements, net energy analyses of the technological options, a maximum credible implementation schedule, legal mechanisms for access to coal and oil shale resources, financing of a synthetic liquid fuels industry, decision making in the petroleum industry, government, incentive policies, local and national economic impacts, environmental effects of strip mining, urbanization of rural areas, air pollution control, water resources and their availability, and population growth and boom town effects in previously rural areas. GRA

N77-12534# Stanford Research Inst., Menlo Park, Calif.
IMPACTS OF SYNTHETIC LIQUID FUEL DEVELOPMENT. AUTOMOTIVE MARKET. VOLUME 2 Final Report
Edward M. Dickson, Robert V. Steele, Evan E. Hughes, Barry L. Walton, and R. Allen Zink Jul. 1976 867 p refs
(Contract EPA-68-03-2016)
(PB-255995/3; SRI-EGU-3505-Vol-2; EPA-600/7-76-004-B) Avail: NTIS HC A99/MF A01 CSCL 21D
For abstract, see N77-12533.

N77-12535# DARCOM Intern Training Center, Texarkana, Tex.
THE FEASIBILITY OF SOLAR ENERGY USAGE ON RED RIVER ARMY DEPOT Final Report
Gerald W. Crowder Apr. 1976 59 p refs
(AD-A025119; DARCOM-ITC-02-08-76-203) Avail: NTIS HC A04/MF A01 CSCL 13/1

This feasibility study considers the usage of solar energy to heat and cool the main office buildings on the Red River Army Depot, Texarkana Texas. Solar Energy costs are compared with the present heating and cooling system costs with an economic analysis using the annual worth and present worth methods. GRA

N77-12536# Wisconsin Univ., Madison. Engineering Experiment Station.
INCREASED FUEL ECONOMY IN TRANSPORTATION SYSTEMS BY USE OF ENERGY MANAGEMENT: SECOND YEAR'S PROGRAM. EXECUTIVE SUMMARY Final Report
N. H. Beachley and A. A. Frank Dec. 1975 22 p
(Contract DOT-OS-30112)
(PB-256117/3; DOT-TST-76-57) Avail: NTIS HC A02/MF A01 CSCL 21D

Design and analytic evaluation of experimental vehicles equipped with a flywheel energy management powerplant (FEMP) are covered. Development of modeling techniques that permit the accurate prediction of transient emissions from an automobile over any driving cycle are discussed. A limited investigation of the fuel-saving potential of relatively straightforward changes to transmissions and drivetrain systems is included. GRA

N77-12537# Beck (R. W.) and Associates, Denver, Colo.
FEASIBILITY STUDY FOR A DIRECT, AIR-COOLED CONDENSATION SYSTEM
Michael D. Henderson Jul. 1976 75 p refs
(Grant EPA-R-803201)
(PB-256403/7; EPA-600/2-76-178) Avail: NTIS HC A04/MF A01 CSCL 13A

The feasibility of utilizing direct, air-cooled condensation systems in coastal environments was investigated. Particular attention was devoted to the prevention of corrosion of external surfaces of fintubes, of coil freezing, and of excessive noise. Manufacturers were contacted to determine the extent of their experience in providing this equipment. Owners and operators of dry towers were visited on site to determine if the equipment can operate satisfactorily under a wide range of load and atmospheric conditions. Performance was also evaluated for the dry tower associated with an 85 MW combined cycle unit under construction. GRA

N77-12538# Arizona Univ., Tucson.
SYMPOSIUM ON THE FUNDAMENTAL OPTICAL PROPERTIES OF SOLIDS RELEVANT TO SOLAR ENERGY CONVERSION
H. Ehrenreich (Harvard Univ., Cambridge) and B. O. Seraphin Nov. 1975 53 p refs Symp. held at Tucson, Ariz., 20-23 Nov. 1975
(Contract NSF DMR-75-18134)
(PB-256615/6) Avail: NTIS HC A04/MF A01 CSCL 10B

Photothermal solar energy conversion and the optical properties of solids are considered. The optical properties of solids at high temperatures are discussed as well as the optical properties and band structures of materials. The photo and thermal stability of solids are stipulated. GRA

N77-12539# Spectrolab, Inc., Sylmar, Calif.
LOW REFLECTIVITY SOLAR CELLS Final Report, 31 May 1974 - 4 Jan. 1976
Paul Stella and James Avery Jan. 1976 83 p refs
(Contract F33615-74-C-2044; AF Proj. 3145)
(AD-A025922; Rept-380-4686F; AFAPL-TR-75-98) Avail: NTIS HC A05/MF A01 CSCL 10/3

Techniques for both reducing and changing specular reflectance from silicon solar cell assemblies (cell and cover) were developed. Mechanical and chemical treatments of quartz cell covers yielded surfaces that acted like nearly perfect diffusers of incoming visible radiation. A four order of magnitude reduction in specular reflectivity was achieved in this manner. Selective etches and multiple antireflection (AR) coatings were used to reduce the total reflection from the cell. Etches such as sodium and potassium hydroxide reduced the total reflection over the entire silicon cell spectrum (350-1100 nm) to below one percent, with a corresponding increase in output current of nearly eight percent over conventionally prepared surfaces. Some degradation in fill factor was observed with the etched surface so that the current increase at the load voltage was somewhat less than at short circuit. GRA

N77-12540# Federal Energy Administration, Washington, D.C. Office of Data and Analysis.
PETROLEUM MARKET SHARES. REPORT ON SALES OF PROPANE TO ULTIMATE CONSUMERS, 1975
30 Apr. 1976 82 p refs
(PB-255624/9; FEA/B-76/307) Avail: NTIS HC A05/MF A01 CSCL 21D

Data are summarized for the period January 1975 through December 1975, provided by refiners and by a sample of independent marketers of propane and propane-butane mixes. Nationally, the total 1975 sales of propane to utlimate consumers as reported in the survey decreased approximately 944 million gallons (10 percentage points) relative to 1974 levels. In 1975, the market share of refiner sales to ultimate consumers decreased approximately 4.7 percentage points over 1974 levels. Non-branded and branded independent marketers appeared to have increased their market share by 2.6 and 2.1 percentage points, respectively. GRA

N77-12541# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
SOLAR CELL OBSERVABLES REDUCTION TECHNIQUES Final Report, Sep. 1974 - Oct. 1975
Jack W. Geis Apr. 1976 45 p refs
(AF Proj. 3145)
(AD-A025923; AFAPL-TR-76-13) Avail: NTIS HC A03/MF A01 CSCL 10/3

An in-house study of the optical and electrical properties of solar cells has revealed that it is possible to reduce the specular component of reflected light intensity by about three to four orders of magnitude through proper treatment of the cell surface, electrical contacts, and the coverglass. The study revealed that cell coverglasses mechanically and chemically treated to produce a roughened surface will multiply reflect and disperse incident light causing a significant reduction in reflected light intensity. GRA

N77-12542# Stanford Univ., Calif. Center for Materials Research.
SOLID ELECTROLYTE BATTERY MATERIALS
Robert A. Huggins 31 Dec. 1975 32 p refs
(Contract N00014-75-C-1056; NR Proj. 056-555)
(AD-A024658; CMR-76-7; TR-5) Avail: NTIS HC A03/MF A01 CSCL 10/3

This work has three major objectives: (1) to investigate a novel technique for producing beta-alumina solid electrolytes for use in sodium-sulfur cells, (2) to search for new fast ion conducting materials for protons or alkali metal ions, and (3) to examine certain mixed conductor materials for potential application in electrodes for advanced secondary battery designs. GRA

N77-12543# Construction Engineering Research Lab. (Army), Champaign, Ill.
THE FEASIBILITY OF A STORABLE PROPELLANT TURBINE/HIGH-SPEED ALTERNATOR AS A COMPACT SHORT-LIFE POWER SYSTEM FOR HARDENED BALLISTIC MISSILE DEFENSE (BMD) INSTALLATIONS Final Report
Nicholas R. Moore Apr. 1976 30 p refs
(AD-A024786; CERL-TR-E-90) Avail: NTIS HC A03/MF A01 CSCL 10/2

Power systems for use in Ballistic Missile Defense (BMD) installations must satisfy unusual requirements. The most significant of these are that the power system must not be adversely affected by strong pressure perturbations in the atmosphere, it must be small and lightweight since volume inside a BMD building is very expensive, and it must reliably fulfill the specified mission. Unfortunately, adaptation of conventional diesel and gas turbine power systems to meet these requirements is expensive. This report describes and technically evaluates a turboalternator power system which is uniquely suited for the BMD mission. This power system consists of an alternator driven by a small turbine which is powered by gaseous products from the decomposition of a single, stored liquid fuel. The system does not consume air from the atmosphere, nor does it require an external cooling system or heat sink. These characteristics give the turboalternator significant advantages which may lead to substantial cost savings over conventional diesel and gas turbine power systems when short operating times are required. GRA

N77-12544# Ross and Baruzzini, Inc., St. Louis, Mo.
THE BASIS FOR EFFECTIVE MANAGEMENT OF LIGHTING ENERGY
15 Apr. 1976 613 p refs Symp. held at Washington, D. C., 29-30 Oct. 1976
(Contract DI-14-01-0001-1845)
(PB-256070/4; FEA/D-76/343) Avail: NTIS HC A99/MF A01 CSCL 13A

The program was arranged to present in sequence as follows: (1) introductory; (2) psychophysics and neurophysiology; (3) human visual performance; (4) models of visual performance; (5) potential for lighting design; (6) energy conservation; (7) codes, standards, and policy; and (8) concluding remarks. GRA

N77-12545# Gordian Associates, Inc., New York.
EVALUATION OF THE AIR-TO-AIR HEAT PUMP FOR RESIDENTIAL SPACE CONDITIONING Final Report
23 Apr. 1976 293 p refs
(Contract FEA-CO-50171-00)
(PB-255652/0; FEA/D-76/340) Avail: NTIS HC A13/MF A01 CSCL 13A

The reliability, market acceptance and energy effectiveness (in comparison to electric resistance and fossil fuel space heating systems) of the electric heat pump for residential space heating were evaluated. The impact of increased heat pump saturation on the nation's primary fuel reserves was also evaluated and justified policy options for the government toward this form of space heating were developed. The approach adopted in the study was (1) to critically evaluate available sources of technical information on heat pump performance and market applicability, (2) to make inquiries of selected electric utilities, heat pump manufacturers and heating and air-conditioning contractors, and (3) to compare by computer simulation the energy effectiveness of the heat pump versus electric resistance and fossil fuel space heating systems for representative climatological regions of the continential United States. GRA

N77-12546# Maine Univ., Orono. Dept. of Electrical Engineering.
TERNARY COMPOUND THIN FILM SOLAR CELLS Quarterly Report, 1 Mar. - 31 May 1976
L. L. Kazmerski Jun. 1976 40 p refs
(Contract NSF AER-75-19576)
(PB-256254/4; NSF/RANN/SE/AER75-19576/PR-75; NSF/RA-760182; QR-3) Avail: NTIS HC A03/MF A01 CSCL 10B

The status of the CuInSe2/CdS heterojunction is discussed. An efficiency of 5.7% is reported for a device illuminated through the CdS layer. I-V and spectral response characteristics are presented. The first thin film CuInS2 homojunction photovoltaic device is also reported. Device fabrication and characteristics are discussed. The production of an epitaxial thin film CuInS2 single crystal Si photovoltaic junction with 4.9% efficiency is reported. Photoconductive properties of the ternary thin films

are indicated. The temperature dependences of the energy gaps of CuInS2, CuInSe2 and CuInTe2 thin films are derived from photoconductivity spectral response measurements. Defects in the chalcopyrite crystal structure are discussed. Dislocation properties are indicated for edge, screw and mixed types. GRA

N77-12547# North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
CONFERENCE PROCEEDINGS, ENERGY FROM THE OCEANS, FACT OR FANTASY
Jerome Kohl, ed. Jan. 1976 118 p refs Conf. held at Raleigh, N. C., 27-28 Jan. 1976 Sponsored by NOAA
(PB-256093/6; UNC-SG-76-04; NOAA-76052603) Avail: NTIS HC A06/MF A01 CSCL 10B

Partial Contents: An overview of the oceans as energy sources; Wave power - nodding duck wave energy extractors; Oceanic windpower; Salinity gradients, tides and waves as energy sources; Legal, political, and environmental aspects of ocean thermal energy conversion; Potential mariculture yield of floating sea thermal power plants; Maritime aspects of producing products at OTEC plants, at sea and delivering them to the United States; A Gulf Stream based ocean thermal differences power plant. GRA

N77-12548# Solarex Corp., Rockville, Md.
DEVELOPMENT OF 20 PERCENT EFFICIENT SOLAR CELL Final Project Report, 1 Jun. 1974 - 31 Aug. 1975
J. Lindmayer Oct. 1975 92 p ref
(Grant NSF GI-43090)
(PB-255903/7; NSF/RANN/SE/GI-43090/FR-75-2; NSF/RA/N-75-309) Avail: NTIS HC A05/MF A01 CSCL 10B

The terrestrial efficiency of silicon solar cells was increased to 20%. The gain in efficiency was obtained by improving the optical coupling, the current, the photovoltage, and the fill factor. Extensive theoretical and experimental work was required to relate these quantities to the basic properties of silicon, the other materials used, and to their interactions. The better understanding of the junction properties has resulted in over 600 mV of photovoltage and nearly 80% fill factor, all significant improvements in the state of the art. GRA

N77-12549# Federal Energy Administration, Washington, D.C. Office of Energy Resource Development.
IMPLEMENTING COAL UTILIZATION PROVISIONS OF ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT
Apr. 1976 42 p ref
(PB-255855/9; FEA/G-76/193) Avail: NTIS HC A03/MF A01 CSCL 10B

The status and current strategy of FEA's program for implementing the coal utilization provisions of the Energy Supply and Environmental Coordination Act of 1974 (ESECA)(P.L.93-319) as amended by the Energy Policy and Conservation Act (EPCA)(P.L.94163) are reviewed. GRA

N77-12550# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HIGH-EFFICIENCY THIN-FILM GaAs SOLAR CELLS Interim Report, 1 Jan. - 31 Mar. 1976
R. J. Stirn, Y. C. M. Yeh, and F. P. Ernest Apr. 1976 44 p refs
(Grant NSF AER-76-01823)
(PB-255821/1; JPL-5030-24; NSF/RA-760128; IR-1) Avail: NTIS HC A03/MF A01 CSCL 10B

A program to develop gallium arsenide (GaAs) thin films with grain sizes suitable for low cost high efficiency solar cell application was initiated. The approach is a recrystallization of evaporated thin germanium (Ge) films on low cost metal substrates by means of scanning focused beams of energy using quartz iodide lamps, lasers, and electron sources. The layer of Ge was then used as a substrate for chemical vapor deposition of GaAs using either the organometallic or halide transport techniques. The materials cost of thin-film GaAs solar cells are predicted for a silicon steel substrate and a nickel/iron substrate. Also discussed is a design for the recrystallization apparatus, a low cost profilometer which was built for surface roughness and layer thickness measurements, a modification in the Vac-Ion evaporation system which allows a considerably higher throughput for solar cell fabrication and plans for the following period. GRA

N77-12551# Brown Univ., Providence, R. I. Div. of Engineering.
ASSESSMENT OF CADMIUM SULFIDE PHOTOVOLTAIC ARRAYS FOR LARGE SCALE ELECTRIC UTILITY APPLICATIONS Final Report
Edgar A. DeMeo Feb. 1976 52 p refs Sponsored by Elec. Power Res. Inst.
(PB-255646/2; EPRI/ER-188) Avail: NTIS HC A04/MF A01 CSCL 10B

A procedure is described which yields nominal cost and performance objectives for any solar cell material employed in noncentrating photovoltaic central stations with horizontal arrays, as functions of powerplant capital cost and structure and wiring costs. Results obtained based on subsystems cost and performance parameters judged to be realistic imply that economically competitive utility central station applications will probably require cell conversion efficiencies of 12% or greater and cell costs near one dollar per square foot. Recent results with Cu2S/CdS cells suggest that these objectives may be achievable. GRA

N77-12552# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
MARITIME AND CONSTRUCTION ASPECTS OF OCEAN THERMAL ENERGY CONVERSION (OTEC) PLANT SHIPS
W. H. Avery, R. W. Blevins, G. L. Dugger, and E. J. Francis Apr. 1976 41 p refs Sponsored by Maritime Admin.
(PB-255639/7; APL/JHU-SR-76-1A; MA/RD-940-T76065) Avail: NTIS HC A03/MF A01 CSCL 10B

An analysis of the maritime, construction, and cost aspects of Ocean Thermal Energy Conversion (OTEC) plant ships for deployment in tropical oceans to produce ammonia and other energy intensive products is given. A concept was developed for OTEC plant ships for use at selected sites in tropical oceans to produce energy intensive products on board. These platforms are very stable under normal operating conditions and serve many other needs. GRA

N77-12553# Westinghouse Research Labs., Pittsburgh, Pa.
THIN FILM SOLAR CELLS FOR TERRESTRIAL APPLICATIONS Quarterly Progress Report, 1 Jan. - 31 Mar. 1976
F. A. Shirland, W. J. Biter, E. W. Greeneich, A. J. Simon, and T. P. Brody 14 May 1976 57 p refs
(Grants NSF AER-75-19712; NSF AER-74-14718-A01)
(PB-255606/6; Rept-76-9G9-TFSOL-R2; NSF/RANN/SE/AER74-14918-A01/PR; NSF/RA-760129; QPR-3) Avail: NTIS HC A04/MF A01 CSCL 10B

The quality and reproducibility of the vacuum deposited CdS film are studied. Variations in the CdS film structure are related to topological features of the substrate. Difficulties with low output cells were traced to copper contamination of the CdS films. An abbreviated re-calibration of the pre-barrier etch and the barrier dip conditions was carried out using the dual component grid system. Preliminary experiments indicate that cooling the cell to LN2 temperature during deposition of the grid contact on the Cu2S layer makes it possible to deposit gold and aluminum without depressing the cell voltage. GRA

N77-12554# Bechtel Corp., San Francisco, Calif.
PRELIMINARY ECONOMICS AND COMMENT: IN-SITU GASIFICATION OF COAL FOR POWER AND SNG
Nov. 1975 32 p refs Sponsored by NSF
(PB-256034/0) Avail: NTIS HC A03/MF A01 CSCL 08I

A preliminary assessment of the commercial role of in-situ gasification of coal is presented. In-situ gasification of coal has been suggested as an alternative to above-ground gasification of coal to produce power or synthetic natural gas from coal. Preliminary cost comparison between the two systems of gasification leading to those products is considered. The comparison was made for both western coal and eastern coal. GRA

N77-12555# Little (Arthur D.), Inc., Cambridge, Mass.
OUTLOOK FOR RESEARCH AND DEVELOPMENT IN THE UNDERGROUND GASIFICATION OF COAL
Nov. 1975 44 p refs Sponsored by NSF
(PB-256155/3; ADL-760012) Avail: NTIS HC A03/MF A01 CSCL 08I

The potential of in-situ coal gasification technology is

compared with conventional coal extraction and utilization to produce pipeline gas or electricity. Also discussed are the nature of the research and development program that appears warranted to bring the technology to the state of commercial acceptance, and significant technical problem areas. GRA

N77-12556# Yuma Proving Ground, Ariz.
REMOTE PORTABLE SOLAR POWERED MICROWAVE SYSTEM
Anthony G. Bottone 1976 10 p
(AD-A025978) Avail: NTIS HC A02/MF A01 CSCL 17/2

During the process of testing, development, and evaluation of Army material, data is often required or desired to be transmitted from remote, isolated or rugged locations. Present day methodology regarding communications support of these remote tests and evaluation is limited in flexibility, mobility, bandwidth, and application. In addition, this present day methodology involves reliance on firm-fixed or generator power and presents a drawback of not being able to operate in real-time modes that are essential in support of some missions of the Department of the Army. To solve the problems mentioned above, a comparatively inexpensive, highly reliable, self contained and simple solution has been devised and successfully tested. A highly efficient microwave transmitter that operates from low voltage DC. power has been coupled with a photovoltaic solar activated power source (array of solar cells). This combination, using a miniature 8 oz. omnidirectional discone antenna, transmitted a 525 line television presentation of a mission test in real time, over a distance of several miles. The portable solar powered terminal took approximately 15 minutes set up time, and operated successfully for the duration of the test. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N77-12557 California Univ., San Diego.
PHOTOCHEMICAL AIR POLLUTION: WEEKDAY-WEEKEND DIFFERENCES Ph.D. Thesis
Barbara Jane Elkus 1976 346 p
Avail: Univ. Microfilms Order No. 76-23135

On weekends in Los Angeles County there is a decrease in the average atmospheric concentrations of NO and reactive hydrocarbons, the primary reactants leading to photochemical air pollution. The behavior of oxidant concentration (used as a measure of the products of the photochemical reactions) does not usually follow that of the primary pollutants. In fact, for most of the year the average weekend oxidant concentration is higher than the corresponding weekday value, despite the lowered emissions. However, for areas and times of particularly high oxidant concentration, for example at inland stations during the summer months, the oxidant levels do decrease on weekends. The emissions alterations include: (1) reduction of overall reactive hydrocarbon and NOx emissions, (2) restriction of morning commuter traffic, and (3) a shift of emissions into the evening and nighttime photochemically inactive hours. A possible short term oxidant control strategy might utilize such emission changes. Dissert. Abstr.

N77-12558 Illinois Univ., Chicago.
PRIORITIES IN AIR POLLUTION SOURCE CONTROL: MODELING OF POPULATION EXPOSURES AND HEALTH EFFECTS Ph.D. Thesis
Niren Laxmichand Nagda 1976 343 p
Avail: Univ. Microfilms Order No. 76-23050

Quantitative models were developed for relating emissions of air pollutants to their effects on people, and the methodology was used to determine the relative importance of sources of air pollution. The computer model consists of three submodels: dispersion, population exposure, and health effects. The model was applied to sources of air pollution in the Chicago Air Quality Control Region. The results show that seventeen out of a total of 227 categories of sources contribute nearly 80 percent to the total air-pollution-population-effect problem. These seventeen categories include commonly recognized large sources, such as automobiles, large electric utility and industrial boilers, as well as less-recognized categories, such as solvent evaporation from industrial operations involving surface coatings. Dissert. Abstr.

N77-12559# World Meteorological Organization, Geneva (Switzerland).
REVIEW OF PRESENT KNOWLEDGE OF PLANT INJURY BY AIR POLLUTION
E. I. Mukammal 1976 38 p refs
(WMO-431; TN-147; ISBN-92-63-10431-X) Avail: NTIS HC A03/MF A01 WMO, Geneva Sw.FR. 12

The role of plants and agriculture as sources of pollutants is described and a review is given of present knowledge regarding the effects of pollutants on plants - both injurious and beneficial. The results of growth chamber investigations on plant response to air pollutants, the limitations of these results, the role of meteorology in the dispersion and transport of air pollutants, micrometeorological methods of evaluating the vertical fluxes of matter and studies relating to pollutants uptake within a vegetation canopy are discussed. Mention is also made of simulation models employed for quantitative estimates of the damaging effects of pollutants on plants. The instrumental requirements for computing concentrations and dosages of pollutants are also outlined. ESA

N77-12560# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
PHYSICAL AND BIOLOGICAL ASPECTS OF THERMAL POLLUTION IN SEA WATER
L. Maiani 7 Nov. 1975 41 p refs In ITALIAN; ENGLISH summary Presented at the Seminar on Principi della Lotta contro gli Inquinamenti delle Acque Marine, Rome, 14-23 Apr. 1975
(ISS-L-75/14) Avail: NTIS HC A03/MF A01

The main physical and biological phenomena related to the discharge of refrigeration waters in marine environment are illustrated. In particular, the size of the coastal areas potentially involved in thermal pollution phenomena in connection with the present forecasts of electric energy production in Italy is discussed, based on the energy budget of an electric power plant making use of either nuclear or natural fuels. Author (ESA)

N77-12561# National Association of Regional Councils, Washington, D.C.
A COMPILATION OF PAPERS PRESENTED AT THE 208 AREAWIDE WATER QUALITY MANAGEMENT WORKSHOPS Final Report
Harold F. Wise, Dave Morell, Eugene T. Jensen, George Hagevik, and Anne M. Blackburn May 1976 328 p refs Workshops held in St. Louis, San. Francisco, and Atlanta, Apr. - May 1976 Prepared in cooperation with Natl. League of Cities
(Contract EPA-68-01-3598)
(PB-254663/8; NARC-76/1) Avail: NTIS HC A15/MF A01 CSCL 13B

An introduction and overview of the institutional aspects of the water quality management program required by Section 208 of the 1972 Federal Water Pollution Control Act Amendments are presented. The requirements and considerations of 208 areawide agencies detailed are: relationships and cooperation needed among state and local institutions; methods for integrating water quality and air quality, solid waste, and water resources plans, etc.; public, private, and government participation requirements and methods; legal/institutional nonpoint source control, and techniques for developing 208 regulatory programs; and how the planning agency can implement and finance the plan through management agencies. GRA

N77-12562# Midwest Research Inst., Kansas City, Mo.
MEASUREMENT OF ATMOSPHERIC SULFATES: LITERATURE SEARCH AND METHODS SELECTION Final Report
Fred J. Bergman and Michael E. Beard Mar. 1976 143 p refs
(Contract EPA-68-02-1728)
(PB-254387/4; EPA-600/4-76-008) Avail: NTIS HC A07/MF A01 CSCL 13B

A thorough literature search for methods of sulfate analysis was completed. The analytical methods have been reviewed for strengths and weaknesses, and the two most promising methods have been selected. Based on this review, the two recommended methods are the methyl thymol blue method and the

barium chloranilate method. The results of this phase of the investigation have been submitted to EPA. Acceptance of the two recommended methods and approval to complete the investigation were received October 15, 1975. GRA

N77-12563# Iowa State Water Resources Research Inst., Ames.
IMPROVING WATER QUALITY BY CONTROL OF ALGAE: CELLULAR AND EXTRACELLULAR BLUE-GREEN ALGAL POLYSACCHARIDES Completion Report
Ruth B. Wildman, William C. Wildman, George E. Rottinghous, and Barbara L. Benner Dec. 1975 131 p refs
(Contracts DI-14-31-0001-3888; DI-14-31-0001-4084)
(PB-254614/1; ISWRRI-74; W76-09760; OWRT-B-043-IA(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

Lakes in Iowa were surveyed for blue-green algal blooms. Physicochemical and biological parameters of four lakes were measured each year during and following blue-green algal blooms of a single dominant species or two co-dominants in one case. One lake was studied for six months during periods of aeration and nonaeration. The ultrastructure of the life cycle of Aphanizomenon flos-aquae was followed in nature and in culture. The influence of strains of Anabaena cylindrica, Anacystic nidulans, and Nostoc muscorum on the pH and buffer capacity of culture media was observed. During periods of dense algal blooms, lake water was collected and processed for isolation of water-soluble organic material which was found to be polysaccharide. GRA

N77-12564# Naval Weapons Center, China Lake, Calif.
AN ANALYSIS OF DATA INPUT SYSTEMS AND A SURVEY OF OTHER DATA BASES FOR THE NAVAL ENVIRONMENTAL PROTECTION SUPPORT SERVICE (NEPSS) Final Report, Jul. 1974 - Jun. 1975
Peggy A. Davis May 1976 41 p refs
(YF57572002)
(AD-A035085; NWC-TP-5820) Avail: NTIS HC A03/MF A01 CSCL 13/2

This report describes two areas of investigation. First, an analysis effort aimed at defining an improved data acquisition and handling system for the Naval Environmental Protection Support Service (NEPSS). Second, a survey of other environmental data bases complementary to the NEPSS system which can be called upon as additional sources of environmental information. Author (GRA)

N77-12565# Bureau of Mines, Pittsburgh, Pa.
A PASSIVE PERSONAL SAMPLER FOR NITROGEN DIOXIDE Technical Progress Report
George H. Schnakenberg Apr. 1976 15 p refs
(PB-254447/6; BM-TPR-95) Avail: NTIS HC A02/MF A01 CSCL 13B

The device, when worn by an individual during his workday, accumulates a sample which is proportional to the time-weighted-average NO2 concentration in the individual's immediate work atmosphere; it is a direct measure of his exposure to NO2. The device is inexpensive to make, lightweight, simple to analyze, and can be used to establish and maintain a record of individual exposures to NO2. The details of operation, the sample construction, and exposure and analysis procedure are described, and evidence is provided supporting the device's accuracy and precision within the mining environment. (GRA)

N77-12566# Center for California Public Affairs, Claremont.
SELF-REGULATION OF ENVIRONMENTAL QUALITY: IMPACT ANALYSIS IN CALIFORNIA LOCAL GOVERNMENT Final Report
Arthur W. Jokela Apr. 1976 142 p refs
(Contract EPA-68-01-2963)
(PB-254450/0; EPA-600/3-76-040) Avail: NTIS HC A07/MF A01 CSCL 13B

The following research objects are considered: (1) Improve the technical quality of environmental impact analysis in the areas of Agency responsibility; (2) improve the ability of the Agency to provide substantive technical review of EIS's prepared by other agencies; and (3) improve the effectiveness of the use of environmental impact analysis in influencing decision making at all governmental levels. This publication is the fourth in a series of reports on environmental impact analysis requirements several State governments have instituted. This report describes implementation of the California law at the local level of government. GRA

N77-12567# Environmental Monitoring and Support Lab., Research Triangle Park, N.C. Quality Assurance Branch.
QUALITY ASSURANCE HANDBOOK FOR AIR POLLUTION MEASUREMENT SYSTEMS. VOLUME 1: PRINCIPLES
Darryl J. VonLehmden and Carl Nelson Mar. 1976 379 p Sponsored by PEDCO-Environmental Specialist Inc., Cincinnati, Ohio
(Contract EPA-68-02-1343)
(PB-254658/8; EPA-600/9-76-005) Avail: NTIS HC A17/MF A01 CSCL 13B

Volume 1 contains brief discussions of elements of quality assurance. Expanded discussions of technical points, including sample calculations, are included in the appendices. The discussion of each element, therefore, is structured to be brief and at the same time, to highlight its most important features. The elements of quality assurance discussed in Volume 1 include document control, quality assurance policy and objectives, organization, quality planning, training, pretest preparation, preventive maintenance, sample collection, sample analysis ,data reporting, procurement quality control, calibration, corrective action, quality cost interlaboratory and intralaboratory testing, audit procedures, data validation, statistical analysis of data, configuration control, reliability, quality reports to management, quality assurance manual, and quality assurance plans for projects and programs. GRA

N77-12568# Equitable Environmental Health, Inc., Woodbury, N.Y.
SELECTED ASPECTS OF WASTE HEAT MANAGEMENT
Allen Serper Jun. 1976 56 p Sponsored by Electric Power Research Inst.
(PB-254401/3; EPRI/FP-165) Avail: NTIS HC A04/MF A01 CSCL 13B

The study reviews the state-of-the-art in: (1) treatment of evaporative cooling systems and offstream cooling system effluents; (2) additional treatment required to utilize wastewater from sewage treatment plants as makeup for cooling systems and boilers; (3) mathematical modeling for power plants cooling systems and discharges; (4) current and recent field monitoring programs; (5) present research to reduce the capital cost and penalties associated with dry cooling towers; and (6) areas where future research is needed. GRA

N77-12569# Naval Coastal Systems Lab., Panama City, Fla.
TOWED PLANNING SLED FOR DELIVERY OF OIL POLLUTION CONTROL EQUIPMENT Final Report
Russell S. Ward Mar. 1976 116 p refs
(AD-A025247; USCG-D-59-76) Avail: NTIS HC A06/MF A01 CSCL 13/10

A Fast Surface Delivery System was developed at NCSL for the Coast Guard to provide an efficient means to load, transport, and offload oil pollution control equipment at sea. A planing hull sled, towable by surface vessel and helicopter, was designed as the transportation vehicle. The all-aluminum sled has a 15-foot beam and is 45 feet long. The system is unique in that it is designed for towing up to 20,000 pounds of equipment at high speeds and with the capability for loading and offloading the equipment manually. Tests results have shown that the equipment-loaded sled can be safely and efficiently towed in sea states 0-2 by an HH3F helicopter at speeds up to 50 knots, and by an 82-foot WPB at speeds up to 17 knots. The system is towable in sea state 3 at reduced speeds. Author (GRA)

N77-12570# Orion Research, Inc., Cambridge, Mass.
SPECIES-DIFFERENTIATING CONTINUOUS MONITOR FOR AIRBORNE ACIDS Quarterly Progress Report, Jul. - Sep. 1975
Martin S. Frant Jan. 1976 48 p
(Contract DAAA15-75-C-0199; DA Proj. 1T7-62709-D-048)
(AD-A025917; ED-CR-76048) Avail: NTIS HC A03/MF A01 CSCL 13/2

The sources and levels of airborne nitric and sulfuric acids are briefly reviewed. A theoretical study, based on known vapor pressures and thermodynamic properties, concludes that in normal industrial environments virtually all of the nitric acid will be

present as vapor, and that virtually all of the sulfuric acid will be as aerosol droplets. Several new collection techniques for separating the two species are proposed. Of these, the most promising appears to be absorption of acidic gases in a wetted-wall scrubber, followed by impingement collection of the aerosol in an ultrasonically-generated aqueous mist. Preliminary experimental results indicate that wetted wall columns can be constructed which will absorb 99% of the acid gases, and pass 98% of the mist droplets. Author (GRA)

N77-12571# Environmental Health Lab., McClellan AFB, Calif.
A BIOENVIRONMENTAL STUDY OF EMISSIONS FROM REFUSE DERIVED FUEL Final Report
Jerry W. Jackson Jan. 1976 114 p refs
(AD-A024661; EHL-M-76M-2) Avail: NTIS HC A06/MF A01 CSCL 13/2

Refuse derived fuel (processed municipal solid waste) was used as a supplement to coal in a utility boiler (80,000 lbs. steam per hour). Furnace emissions were determined from coal, and from 1:1 and 2:1 mixes (by volume) of refuse derived fuel (RDF) and coal respectively. In comparison with coal, the 1:1 mix had significantly lower sulfur dioxide, hydrocarbon and nitrogen oxide emission levels. Particulate emissions were unchanged. Lead, chloride and fluoride emissions were significantly increased. The 2:1 mix had lower SO2 and HC emission levels but higher nitrogen oxide emissions and erratic particulate emissions. Lead, chloride and fluoride emissions were significantly increased. Operators had difficulty controlling furnace temperature, fuel distribution and fuel: air ratios during use of the 2:1 mix. Except for increased lead emissions, the use of RDF in a 1:1 mix with coal was favorably indicated. The increased emission of lead creates a complex environmental question. No Federal emission or air quality standard for lead has been promulgated and scientific controversy exists as to an 'accepte' level for airborne lead. The EPA has not proposed any standards, but has issued an opinion calling for the reduction of lead whenever possible. Any planned use of RDF in units not equipped with efficient particulate control devices (efficient for submicrometer particles) must address the problem of increased lead emission. Lead was found predominantly in the submicrometer particle size fraction. Particles in the stack effluent contained 245 times more lead than particles collected by a multiclone. GRA

N77-12572# Arctec, Inc., Columbia, Md.
TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS, PHASE 2 Final Report, Jul. - Dec. 1975
L. A. Schultz Jan. 1976 178 p refs
(Contract DOT-CG-51487-A)
(AD-A025748; Rept-273-C; USCG-D-55-76) Avail: NTIS HC A09/MF A01 CSCL 13/2

This final report summarizes the results of tests conducted in broken ice cover with crude oil and No. 2 fuel oil of five oil spill recovery devices manufactured by Lockheed, Marco, Ocean Systems, JBF Scientific, and Oil Mop. Additional tests were conducted to determine the natural spill thickness of crude oil and No. 2 fuel oil in open water at low temperature and in broken ice over. The spreading tests indicated that thin oils will spread to a very thin layer whether in open water or in broken ice cover. Heavy oils in broken ice cover will achieve a natural equilibrium thickness many times greater than the open water thickness due to the partial containment of the oil by the broken ice pieces. The oil recovery tests demonstrated that modifications made to the Lockheed and Marco devices did improve their performance when operating in broken ice cover. Tests conducted with the OSI, JBF, and Oil Mop units were more elementary in nature and did not incorporate modification of the devices for use in ice. GRA

N77-12573# Battelle Columbus Labs., Ohio.
RESEARCH, DESIGN, AND DEVELOPMENT OF THE U.S. COAST GUARD HIGH SEAS OIL CONTAINMENT SYSTEM Final Report, Sep. 1970 - Sep. 1975
James M. Tierney Sep. 1975 308 p refs
(Contract DOT-CG-23223-A)
(AD-A025749; USCG-D-42-76) Avail: NTIS HC A14/MF A01 CSCL 13/2

The objective of this program was to develop a lightweight air-deliverable oil barrier system, capable of containing significant quantities of oil at sea states to 5-foot waves and 1-knot currents, and in winds up to 20 knots, and of sustaining with minimal damage 10-foot waves, 2-knot currents, and 40-knot winds. An inflatable-supported curtain barrier, self-floating air-deliverable barrier-storage/deployment container, and barrier moorings were developed from initial concept stages to full-scale usable equipment. Model and field tests were conducted and modifications were made as required. An at-sea test of the interfaced subsystems demonstrated the validity of the final design and the viability of the air-delivery method. GRA

N77-12574# Systems Control, Inc., Palo Alto, Calif.
EVALUATION OF WATER QUALITY MODELS: A MANAGEMENT GUIDE FOR PLANNERS Final Report
G. Paul Grimsrud, E. John Finnemore, and H. James Owen Jul. 1976 186 p refs
(Contract EPA-68-01-2641)
(PB-256412/8; EPA-600/5-76-004) Avail: NTIS HC A09/MF A01 CSCL 13B

A handbook specifically oriented to water quality and water resources planners and managers is presented. Procedures for model evaluation, model selection, integration of modeling with planning activities, and contracting modeling projects are described. Planners without previous experience in water quality modeling may use the information and procedures to determine whether a water quality model could and should be used in a particular planning program, and which specific model would be cost effective according to specific project needs. GRA

N77-12575# Ohio State Univ., Columbus. Dept. of Chemistry.
MECHANISM OF PHOTOCHEMICALLY INITIATED OXIDATIONS Final Report, Jan. 1973 - Dec. 1975
Jack G. Calvert Jun. 1976 200 p refs
(Grant EPA-R-800398)
(PB-256397/1; EPA-600/3-76-070) Avail: NTIS HC A09/MF A01 CSCL 13B

Several observations were made relative to chemical reactions that occur in sunlight-irradiated Nox/hydrocarbon/aldehyde/CO/SO2 polluted atmospheres. Many of the primary reactions that are needed to quantitatively evaluate the photo-oxidation mechanisms of SO2 in the atmosphere were measured. Rate constants for the reactions of the excited SO2(triplet B1) state of SO2 with various atmospheric gases, alkanes, alkenes, NO, CO, etc., were determined. The rate of SO2 photooxidation in the atmosphere is estimated, and the possible role of excited-SO2/alkene interactions that generate aerosols is evaluated. GRA

N77-12576# Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
AIR QUALITY CONSIDERATIONS IN TRANSPORTATION PLANNING: FINDINGS AND RECOMMENDATIONS ON TRANSPORTATION CONTROL PLANNING, PHASE 2 Final Report
Elizabeth Bennett, Creig Harvey, Ann Rappaport, and Mabelle Bessey 30 Dec. 1975 223 p refs
(Contract EPA-68-01-2476)
(PB-256424/3; CTS-75-21) Avail: NTIS HC A10/MF A01 CSCL 13B

Transportation control plan (TCP) development was merged with ongoing transportation activities. Recommended procedures for assessing the consistency between transportation proposals and air quality needs are presented. Opportunities for improving coordination among DOT and EPA programs are identified. Issues involved in parking management are explored, and recommendations are made on the development of amendments to the Clean Air Act. GRA

N77-12577# Environmental Protection Agency, Denver, Colo. Control Technology Section.
AMMONIA TOXICITY
William T. Willingham Feb. 1976 105 p refs
(PB-256447/4; EPA-908/3-76-001) Avail: NTIS HC A06/MF A01 CSCL 13B

Harmful effects of ammonia are primarily related to the pH and temperature of the water because only the un-ionized ammonia is toxic. The un-ionized fraction increases with rising pH values and with rising temperature. Dissolved oxygen, alkalinity,

free carbon dioxide, sodium ions, total dissolved solids, prior exposure to ammonia, physical stress, general physiological status, and the presence of other additive toxins or other mitigating parameters affect the overall toxicity of ammonia to aquatic organisms. The highest concentration of un-ionized ammonia which will not cause adverse effects is 0.02 mg/1 NH sub 3-N. GRA

N77-12578# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.

DIRECTORY OF AIR QUALITY MONITORING SITES ACTIVE IN 1974 Annual Report

May 1976 747 p

(PB-256708/9; EPA-450/2-76-008) Avail: NTIS HC A99/MF A01 CSCL 13B

Listed are all monitoring sites active in 1974 which have submitted SAROAD site identification forms. Each site to be classified as operational and listed in this directory must have sampled at least one pollutant in 1974. In addition to the site listings, this document reflects useful information on the pollutant sampled. GRA

N77-12579# Army Aeromedical Research Lab., Fort Rucker, Ala.

PILOT OPINION OF FLIGHT DISPLAYS AND MONITORING GAUGES IN THE UH-1 HELICOPTER Final Report

Ronald R. Simmons, Mark A. Hofmann, and Michael A. Lees Apr. 1976 45 p refs

(AD-A024714; USAARL-76-18) Avail: NTIS HC A03/MF A01 CSCL 01/4

Subjective responses were acquired from 54 Army aviators concerning the UH-1 instrument panel. The aviator subjects were drawn from three experience levels: student, 'tac-ticket', and fully instrument rated pilots. They were asked to rank instruments with regard to frequency of use, order of preference, reliability and readability. The instruments were divided into flight displays and monitoring gauges. Ranks were requested for various profiles and flight conditions. Data analyses examined the amount of agreement between experience levels as well as the rankings concerning the areas mentioned above. GRA

N77-12580# Pacific Environmental Services, Inc., Santa Monica, Calif.

EVALUATION OF SO2 EMISSION CONTROL TECHNOLOGY APPLICABLE TO THE EAST HELENA LEAD SMELTER Final Report

I. J. Weisenberg Jan. 1975 103 p refs

(Contract EPA-68-02-1354)

(PB-255277/6) Avail: NTIS HC A06/MF A01 CSCL 11F

Lead smelter operations generating SO2 and particulates were studied. Sulfuric acid plant technology is considered as well as lead smelters with sulfuric acid plant SO2 control. Sulfuric acid plant operations with lead sintering machine problems and their solutions are presented. The SO2 control is examined for the ASARCO lead smelter in East Helena, Montana. S.M.

N77-12581# University of Southern Calif., Los Angeles. Allan Hancock Foundation.

TEMPERATURE EFFECTS OF CRUDE OIL IN THE UPPER INTERTIDAL ZONE Final Report

Dale Straughan Jul. 1976 67 p refs Sponsored by ERA

(PB-255956/5; EPA-600/2-76-127) Avail: NTIS HC A04/MF A01 CSCL 13B

Experiments were conducted in the field and laboratory in Southern California to determine the effects of heavy black asphaltic Santa Barbara crude oil on the intertidal barnacle Chthamalus fissus. Observations were also made on surfaces in the Santa Barbara Channel oiled following the 1969 Santa Barbara oil spill. The data presented support the original hypothesis that this type of oil acts as a black body. It is this black body effect which has a long term influence on Chthamalus fissus distribution after the oil has developed a hard surface crust. GRA

N77-12582# Colorado State Univ., Fort Collins. Environmental Research Center.

TOXIC HEAVY METALS IN GROUNDWATER OF A PORTION OF THE FRONT RANGE MINERAL BELT Final Completion Report

Ronald W. Klusman and Kenneth W. Edwards Jun. 1976 71 p refs

(Grants DI-14-31-0001-4006; DI-13-41-0001-5006)

(PB-256212/2; W76-11105; OWRT-A-023-Colo(2); Completion-72) Avail: NTIS HC A04/MF A01 CSCL 13B

A study of toxic trace metal distribution in ground waters of the Front Range mineral belt, Colorado and adjacent areas was completed in order to determine the relationship of water quality to mineralization and the magnitude of potential health effects. Samples were collected and analyzed for arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc. Field determinations of pH, Eh, and specific conductance were also made. The samples were divided into two populations; those inside the mineral belt and those outside. Utilizing the observed data distributions, geochemical abundance estimates are made. GRA

N77-12583# Abcor, Inc., Cambridge, Mass. Walden Research Div.

GROWTH EFFECTS OF MAJOR LAND USE PROJECTS. VOLUME 3: SUMMARY Final Report

Frank H. Benesh, Peter Guldberg, and Ralph DAgostino Sep. 1976 249 p refs

(Contract EPA-68-02-2076)

(PB-256204/9; EPA-450/3-76-012-C-Vol-3) Avail: NTIS HC A11/MF A01 CSCL 13B

A research program whose goal is to formulate a methodology to predict air pollutant emissions resulting from the construction and operation of two types of major land use projects, large residential projects and large concentrations of employment is discussed. Emissions are quantified from the major project, from land use induced by the major project, from secondary activity occurring off site (i.e., generation of electricity by utilities), and from motor vehicle traffic associated with both the major project and its induced land uses. A summary is provided of the specification and causal analysis of the land use model and the development of the land use based emission factors. The development of the predictive equations in the land use model and the development of the traffic model are presented. GRA

N77-12584# State Univ. of New York, Buffalo. Dept. of Civil Engineering.

CHLORIDE MANAGEMENT IN LAKE ERIE BASIN

Dale D. Meredith and Ralph R. Rumer, Jr. Jun. 1976 74 p refs

(Contract DI-14-31-0001-5059)

(PB-256241/1; RR-76-2; W76-11114; OWRT-B-044-NU(3)) Avail: NTIS HC A04/MF A01 CSCL 13B

The deicing salt runoff from Buffalo, New York and selected nearby communities has been measured and it was found that, in the case of Buffalo, approximately 90% of the deicing salt applied is recovered by the combined sewer system. The Lake Erie drainage basin was subdivided into regions and a search of the literature was made to establish the historical data for chloride discharge from each region. Time-dependent equations were estimated for the annual chloride discharge from each source region and used in conjunction with a mathematical model for chloride balance in Lake Erie. The calibrated model projects a chloride concentration in Lake Erie of 137 ppm by the year 2050. GRA

N77-12585# Booz-Allen and Hamilton, Inc., Washington, D.C.

ECONOMIC IMPACT OF POLLUTION REGULATIONS ON STEEL PLANTS IN THE MAHONING RIVER VALLEY Final Report

John Reilly 28 Apr. 1976 89 p

(Contract EPA-68-01-2824)

(PB-256338/5) Avail: NTIS HC A05/MF A01 CSCL 13B

An analysis is made of whether (1) the return on investment from continued operation of eight steel plants in the Mahoning Valley of Ohio is sufficient to justify the investment in pollution controls required and (2) the firms would be able to raise sufficient capital to provide pollution control equipment for these plants in the context of the total capital requirements of the firms. GRA

N77-12586# Environmental Protection Agency, Cincinnati, Ohio Solid Waste Management Office.
LABORATORY PROCEDURE FOR THE POTENTIAL HEAT DETERMINATION IN SOLID WASTES Open-File Report
Donald L. Wilson 1971 13 p
(PB-256378/1; SWR-135) Avail: NTIS HC A02/MF A01 CSCL 13B

A method and apparatus for evaluating potential heat of solid wastes are presented. Wastes with low or negative heat content values are determined by the described method. GRA

N77-12587# Teknekron, Inc., Berkeley, Calif.
ASSESSMENT OF THE IMPACT OF PROPOSED THERMAL EFFLUENT GUIDELINES FOR THE STEAM ELECTRIC POWER INDUSTRY
11 Nov. 1976 120 p
(Contract FEA-C-04-50041-00)
(PB-255937/5; TK-75-0016; FEA/D-76/338) Avail: NTIS HC A06/MF A01 CSCL 13B

The possible impacts on the electrical utility industry of proposed water pollution control regulations are assessed. The Federal Water Pollution Control Amendments of 1972 are analyzed as well as the proposed regulations affecting the steam electric power industry which EPA issued as part of the implementation of that Act. The potential near term fuel penalty associated with mandated dates for compliance and coverage of existing steam generating units is explored in depth. GRA

N77-12588# Environmental Protection Agency, Washington, D.C. Div. of Stationary Source Enforcement.
COMPLIANCE STATUS OF MAJOR AIR POLLUTION FACILITIES Final Report
Apr. 1976 518 p
(PB-256653/7; EPA-340/1-76-004) Avail: NTIS HC A22/MF A01 CSCL 13B

The first in a series of periodic reports is presented and it deals with the probable compliance status and related facility information for major stationary sources of air pollution. The contents were generated from the U.S. Environmental Protection Agency's compliance data system and are not intended to represent the true legal status of facilities with respect to applicable air pollution regulations but rather those facilities of interest to the states or the Agency for further investigation. GRA

N77-12589# Science Applications, Inc., Westlake Village, Calif.
AIR QUALITY MODELS REQUIRED DATA CHARACTERIZATION Final Report
Ralph C. Sklarew and John C. Wilson May 1976 78 p Sponsored by EPRI prepared in cooperation with Xonics, Inc.
(PB-255730/4; EPRI/EC-137) Avail: NTIS HC A05/MF A01 CSCL 13B

The objective of this study was to develop a document to aid in the design of research programs to furnish sufficient data for evaluation of air quality plume modeling. This major objective was met by assembling, primarily through the use of questionnaires sent throughout the modeling community, the input parameter requirements of a majority of current plume models. From the responses of 44 air quality modeling groups a rather complete picture emerged of current models and their input requirements as well as of developing directions. From the survey it is clear that most models have been constructed to use data which can be readily obtained. GRA

N77-12590# Illinois Inst. for Environmental Quality, Chicago.
A METHOD FOR THE DETERMINATION OF TOTAL MERCURY IN AMBIENT AIR Final Report
A. M. Hartley and D. J. Devine (Ill. Univ., Urbana) Feb. 1976 76 p refs
(PB-255698/3; IIEQ-76-04) Avail: NTIS HC A05/MF A01 CSCL 13B

A method is described for the collection and measurement of total mercury in ambient air over a concentration range of 0.2 ng/cu m to 2.5 Hg/cu m. The collection system utilizes a pyrolyzer to convert mercury compounds to elemental mercury which is then collected on gold coated glass beads in a collection tube. Collected mercury is released for measurement by heating the collection tubes to 650 C in a gas stream which transports the vapor to the absorption cell of an atomic absorption spectrophotometer. Pyrolysis studies indicate that mercuric chloride, methylmercuric chloride, diphenylmercury are recovered with an efficiency of at least 95 percent. GRA

N77-12591# Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
SUMMARY CHARACTERIZATIONS OF SELECTED CHEMICALS OF NEAR-TERM INTEREST Final Report
Apr. 1976 50 p refs
(PB-255817/9; EPA-560/4-76-004) Avail: NTIS HC A03/MF A01 CSCL 13B

Characterizations of 15 chemicals of near-term concern to EPA are considered. The report summarizes: (1) health and ecological effects and environmental behavior; (2) sources, environmental levels and exposed populations; (3) technologic and economic aspects; and (4) steps that have been taken and are being taken. GRA

N77-12592# Energy and Environmental Analysis, Inc., Arlington, Va.
LAWS AND REGULATIONS AFFECTING COAL WITH SUMMARIES OF FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS PERTAINING TO AIR AND WATER POLLUTION CONTROL, RECLAMATION, DILIGENCE AND HEALTH AND SAFETY, PART 1
Jun. 1976 571 p refs
(Contract DI-14-01-0001-2115)
(PB-255927/6; DOI/OMPRA/CL-76/01-Pt-1) Avail: NTIS HC A24/MF A01 CSCL 13B

All of the federal, state, and local laws and regulations which affect the production and consumption of coal are summarized. GRA

N77-12593# Mississippi State Univ., Mississippi State. Water Resources Research Inst.
REMOVAL OF ALGAE FROM WASTE STABILIZATION POND EFFLUENT
Marvin T. Bond and Bruce A. Mowry Jul. 1976 66 p refs Sponsored by Dept. of Interior
(PB-256512/5; W76-11171; OWRT-A-096-MISS(1)) Avail: NTIS HC A04/MF A01 CSCL 13B

The variances of selected parameters for waste stabilization pond effluents treated with alum alone and with alum used with polyelectrolytes were determined. The sludge volume and characteristics produced in the physical-chemical process are stipulated. The use of lime in place of alum was studied. Effluents were collected for four sampling conditions and treated in the laboratory to determine chemical requirements and sludge characteristics. Alum requirements were in the range of 60 to 100 mg/l while lime requirements varied from 250 to 600 mg/l. Various polyelectrolytes were tried and produced fair results when cationic polymers when used in concentrations greater than 15 mg/l. GRA

N77-12594# Rutgers Univ., New Brunswick, N.J. Water Resources Research Inst.
RELATIONSHIP BETWEEN WATER QUALITY AND PLANT GROWTH IN PONDS
Donald N. Reimer and Harry L. Motto Jul. 1976 43 p
(Contract DI-14-31-0001-4030)
(PB-256513/3; W76-11170; OWRT-A-034-NJ(3)) Avail: NTIS HC A03/MF A01 CSCL 13B

Phytoplankton was generally at a maximum in late summer or early fall. Because of different vegetation types in different ponds, quantitative comparisons of growth among ponds could not be made. Maximum nitrate levels occurred during the winter, and minimum levels occurred during the period of maximum phytoplankton growth. Soluble phosphorus was at a minimum during the winter and at a maximum during the summer. Carbon dioxide at the surface was depleted during periods of maximum phytoplankton growth but reached its maximum at the pond bottoms at the same time. GRA

N77-12595# Southern Research Inst., Birmingham, Ala.
RAPPING REENTRAINMENT IN A NEARLY FULL-SCALE PILOT ELECTROSTATIC PRECIPITATOR Final Report, Mar. 1975 - Jan. 1976
Herbert W. Spencer, III May 1976 179 p refs

(Contract EPA-68-02-1875)
(PB-255984/7; SORI-EAS-76-061; SORI-3489-V; EPA-600/2-76-140) Avail: NTIS HC A09/MF A01 CSCL 13B

An experimental investigation of rapping reentrainmnet in a nearly full-scale pilot electrostatic precipitator is reported. The mechanics of removal of dry dust by rapping and the quantification of rapping reentrainment in terms of the percentage and the particle size distribution of the reentrained dust are examined. A decrease in rapping emissions was obtained by increasing the time interval between raps. The mass median diameters of the size distributions of the particles emitted during the raps were observed to increased with increased time between raps. GRA

N77-12596# Utah Water Research Lab., Logan.
DEVELOPMENT OF A WATER QUALITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH
Craig J. Jones, Calvin G. Clyde, William J. Grenney, and J. Paul Riley Jun. 1976 133 p refs
(Contract DI-14-31-0001-5045)
(PB-255718/9; PRJEW026-1; W76-10815; OWRT-A-025-UTAH(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

A model capable of predicting the long term (seasonal) distribution of water quality constituents within Great Salt Lake is described. This capability allows investigation of the effects which alternative water quality management plans will have on the distribution of water quality constituents within the lake. The water quality model of the lake is based on the application of the advection-diffusion equation to the three-dimensional transport of a quality constituent. GRA

N77-12597# Industrial Environmental Research Lab., Research Triangle Park, N. C.
PROCEDDINGS: SYMPOSIUM OF FLUE GAS DESULFURIZATION, VOLUME 1
Richard D. Stern, Wade H. Ponder, and Roger C. Christman (TRW, Inc., Cleveland, Ohio) May 1976 562 p refs Symp. held in New Orelans, Mar. 1976
(PB-255317/0; EPA-600/2-76-136-a-Vol-1) Avail: NTIS HC A24/MF A01 CSCL 13B

The proceedings document the presentations made during the symposium, which dealt with the status of flue gas desulfurization technology in the United States and abroad. Subjects considered included: regenerable, non-regenerable, and advanced esses; process costs; and by-product disposal, utilization, and marketing. The purpose of the symposium was to provide developers, vendors, users, and those concerned with regulatory guidelines with a current review of progress made in applying processes for the reduction of sulfur dioxide emissions at the full- and semi-commercial scale. GRA

N77-12598# C-E Power Systems, Windsor, Conn.
LABORATORY ANALYSIS OF SOLVENT REFINED COAL
R. W. Borio Jun. 1976 56 p Sponsored by Elec. Power Res. Inst.
(PB-255550/6; EPRI-1235-2A; TR-1) Avail: NTIS HC A04/MF A01 CSCL 13B

With respect to air pollution control in electric power generation, two basic routes were pursued: (1) to clean up the flue gas before admitting it to the atmosphere, and (2) to clean up the fuel before it is burned in the utility boiler. A solvent refined coal (SRC) process was pursued and construction of a pilot plant was completed. The process solubilizes about 95% of the moisture-ash-free coal in a dissolver operated at 1800 psig and 825 F with a residence time on the order of 30 minutes. The technical feasibility of using SRC as a utility power plant fuel is determined. GRA

N77-12599# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
A DIFFRACTION TECHNIQUE TO MEASURE SIZE DISTRIBUTION OF LARGE AIRBORNE PARTICLES Final Report
A. McSweeney Jul. 1976 58 p refs
(Grant EPA-R-802214)
(PB-255454/1; EPA-600/3-76-073) Avail: NTIS HC A04/MF A01 CSCL 13B

A coherent optical diffraction technique for measuring the size distribution of large particles was tested. This technique is based on the generation of a transformation matrix which is used to relate the measured diffraction patterns to the size distribution of the samples that produced the patterns. Four types of samples are considered: (1) pinholes in opaque discs, (2) photographic transparencies with opaque circular spots, (3) particles deposited on microscope slides, and (4) aerosols. Computer simulations are performed to assess the accuracy and resolution of the techniques. Improvements based on a reduction of system noise and an increase in detector sensitivity are discussed. GRA

N77-12600# Delaware Univ., Newark. Coll. of Marine Studies.
PHYSICAL-CHEMICAL METHODS FOR THE CONTROL OF ALGAL SPECIES AND COMPOSITION IN ALGAL CULTURING FACILITIES
Richard F. Srna, Ann Baggaley, and Walter Page Jan. 1976 32 p refs Presented at 7th Ann. Meeting of the World Mariculture Soc., San Diego, Calif., 26-29 Jan. 1976
(Grant NOAA-04-3-158-30)
(PB-256784/0; DEL-SG-8-76; NOAA-76052803) Avail: NTIS HC A03/MF A01 CSCL 08A

Three methods are described for the selective culture of Thalassiosira pseudonana, a desirable bivalve food, in the presence of a contaminant species Phaeodactylum tricornutum, an undesirable. The first method takes advantage of differences in cell wall strength between the two types of algae. The second method involves manipulation of nutrient levels in a mixed culture of Thalassiosira pseudonana and Phaeodactylum tricornutum to eliminate one or the other species from the culture. The third method utilizes a harvesting reseeding technique to maintain a relatively constant concentration of the slower-growing species in a semi-continuous mixed culture containing Carteria chuii and Thalassiosira pseudonana. GRA

N77-12601# Air Pollution Technology, Inc., San Diego, Calif.
A. P. S. ELECTROSTATIC SCRUBBER EVALUATION Final Report, Jun. 1975 - Apr. 1976
Seymour Calvert, Joel Rowan, Shuichow Yung, Charles Lake, and Harry Barbarika Jun. 1976 76 p refs
(Contract EPA-68-02-1496)
(PB-256335/1; EPA-600/2-76-154-a) Avail: NTIS HC A05/MF A01 CSCL 07A

The computation of fine particle collection efficiency as a function of particle size is presented. An electrostatic scrubber was operated at 21.0 and 22.7 actual cu m/min at 16C with a pressure drop of approximately 40 cm W.C. Titanium dioxide was generated as the test aerosol having an approximate mass mean diameter (aerodynamic) of 1.0 micrometer with a geometric standard of 2.2. Testing was performed to determine if static charges were affecting the sampling measurements. Particle size and collection efficiency changed when charge neutralizing devices were used. GRA

N77-12602# Army Tank-Automotive Center, Warren, Mich.
A PROCEDURE FOR THE STATISTICAL ANALYSIS OF VEHICULAR NOISE EMISSION SPECTRA FOR LIMITED SAMPLES Report, Apr. 1973 - Mar. 1974
Richard N. Brooke, Jr. 1976 11 p refs
(AD-A025981) Avail: NTIS HC A02/MF A01 CSCL 13/2

Recent emphasis on the reduction of environmental pollution has prompted the legislation of many new standards defining maximum noise limits inside of, and in close proximity to all types of commercial and military automotive vehicles. These standards require the collection of noise emission data on both newly produced and inservice vehicles for determination of conformance. Since every vehicle to be produced or currently in existence that falls within the jurisdiction of the standards cannot be measured individually due to time and cost constraints, a method of accurately predicting the noise profile of a large population of similar type vehicles utilizing data collected from only a limited sample of the population is required. This paper presents such a statistical method, and illustrates its application utilizing data taken on multiple samples of several types of military tactical vehicles. GRA

N77-12603# Air Force Civil Engineering Center, Tyndall AFB, Fla.
VAPOR PHASE SPECTRA FOR AIR POLLUTION STUDIES Final Report, 1 Jul. 1972 - 31 Nov. 1974
Robert R. Birge, James T. Haney, and Edward Ricco Aug. 1975 148 p refs
(AF Proj. 1900)
(AD-A025156; AFCEC-TR-75-15) Avail: NTIS HC A07/MF A01 CSCL 13/2

Infrared absorption spectra of the following substances in the vapor phase are presented: acetaldehyde, acetonitrile, acrolein, ammonia, carbon dioxide, carbon monoxide, ethane, ethylene, formaldehyde, formic acid, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, methane, methanol, nitric oxide, nitrogen dioxide, nitrous oxide, ozone, sulfur dioxide, and water. Resolution is 0.5/cm and low sample pressure further enhances fine structure of the absorption bands. The frequencies of nearly 3000 absorption lines for these compounds, accurate to 0.1/cm, are listed in tabular form. A discussion of techniques to minimize noise problems in Fourier transform spectroscopy is included.
Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N77-12604 California Univ., Los Angeles.
PALEOBIOLOGY AND PALEOECOLOGY OF MIDDLE CAMBRIAN ALGAE FROM WESTERN NORTH AMERICA Ph.D. Thesis
Donna Fields Satterthwait 1976 134 p
Avail: Univ. Microfilms Order No. 76-22212

The primary focus is on three fossil algal assemblages, all of Middle Cambrian age (approximately 540 million years old): the Langston Formation (Spence Member) of Utah; the Wheeler Shale of Utah; and the Stephen Formation (Burgess Member) of British Columbia. The geologic setting--an important consideration for paleoenvironmental interpretation--is discussed for each of these units; although differing somewhat in detail, each appears to have been deposited in a near-shore, marine environment. Preserved generally as carbonaceous compressions on the shale bedding planes, the fossil algal specimens discussed here represent 10 genera and 22 species. Two new genera and species are here established: Dichotomophylloides burgessensis and Palaeohymenophykos walcottiana. Each of the 10 genera is given separate consideration; the locality and the number of specimens studied are cited, and possible analogues among modern algae are discussed. Dissert. Abstr.

N77-12605 Texas Univ. at Dallas, Richardson.
CONTRIBUTIONS TO PALEOMAGNETISM AND Rb-Sr GEOCHRONOLOGY Ph.D. Thesis
Jose Celestino Guerrero-Garcia 1976 139 p
Avail: Univ. Microfilms Order No. 76-23150

Paleomagnetic studies carried out on a late Oligocene volcanic sequence exposed to the west of Ciudad Durango, Mexico, have allowed the identification of five reversals (six polarity periods) of the earth's magnetic field as well as the secular variation imprinted in the flows, both features being potentially useful for stratigraphic correlation. Characteristic directions of remanent magnetization were obtained at seventeen sites. The results indicate that the deposition of some units was very closely spaced in time, and that other units may be a composite of several different flows. An ignimbrite not previously recognized was identified below the oldest unit reported in one of the sampled sections by means of paleomagnetic criteria, as its polarity was opposite to the unit above. Rubidium-strontium total rock and mineral analyses of crystalline rocks along the Pacific coast of Southern Mexico, between Acapulco and Puerto Angel, have provided new information regarding the geologic evolution of the area. Dissert. Abstr.

N77-12606*# Ohio Univ., Athens. Avionics Engineering Center.
DIURNAL MEASUREMENTS WITH PROTOTYPE CMOS OMEGA RECEIVERS Technical Report, Oct. - Nov. 1976
R. W. Burhans Nov. 1976 16 p refs
(Grant NGR-36-009-017)
(NASA-CR-149160; TM-42) Avail: NTIS HC A02/MF A01 CSCL 04A

Diurnal signals from eight omega channels have been monitored at 10.2 KHz for selected station pairs. All eight Omega stations have been received at least 50 percent of the time over a 24 hour period during the month of October 1976. The data presented confirm the expected performance of the CMOS omega sensor processor in being able to digsignals out of a noisy environment. Of particular interest are possibilities for use of antipodal reception phenomena and a need for some ways of correcting for multi-modal propagation effects. Author

N77-12607# Instituto Geografico Agustin Codazzi, Bogota (Colombia). Oficina de Estudios Geograficos.
HISTORY OF EARTHQUAKES IN COLOMBIA [HISTORIA DE LOS TERREMOTOS EN COLOMBIA]
Jesus Emilio Ramirez 1969 190 p refs In SPANISH
Avail: NTIS HC A09/MF A01

The history of earthquake disasters in Colombia, South America is discussed in detail to promote scientific investigations, and to call attention to engineers, architects, contractors, insurance companies and building owners as to the conditions that must be included in the construction of earthquake resistant structures for the protection of city dwellers. Transl. by B.B.

N77-12608*# Transemantics, Inc., Washington, D.C.
APPROXIMATING FUNCTIONS FOR EARTH ATMOSPHERIC DENSITY
L. Burs and A. Pal NASA Aug. 1976 26 p refs Transl. into ENGLISH of Russian conf. paper Presented at Sci. Results of the Intercosmos Collaboration; Conf. on Sci. Res. by Artificial Satellites Observations, Budapest, 21-24 Oct. 1974
(Contract NASw-2792)
(NASA-TT-F-17107) Avail: NTIS HC A03/MF A01 CSCL 04A

Approximating functions for a given atmospheric density model and a function for density which is dependent on diurnal effect are formulated. General formulas that consider a wider range of parameters are also given. Author

N77-12609*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SURVEY OF KINETIC DATA OF COMPOUNDS CONTAINING FLOURINE
Dana A. Brewer Nov. 1976 119 p refs
(NASA-TM-X-73983) Avail: NTIS HC A06/MF A01 CSCL 04A

Chlorofluoromethanes may have a significant effect on the level of ozone in the atmosphere. However, the role of fluroine-containing compounds has not been examined fully. A tabulation of a search of the chemical kinetic literature published between 1953 and July 1975, is presented. The data are then evaluated with respect to acceptability and importance to the overall reaction balance in the atmosphere. Possible future research to elucidate important reaction processes is discussed.
Author

N77-12610*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN ASSESSMENT OF PREWHITENING IN ESTIMATING POWER SPECTRA OF ATMOSPHERIC TURBULENCE AT LONG WAVELENGTHS
Samuel R. Keisler (SDC Integrated Services, Inc.) and Richard H. Rhyne Washington Nov. 1976 55 p
(NASA-TN-D-8288; L-10502) Avail: NTIS HC A04/MF A01 CSCL 04A

Synthetic time histories were generated and used to assess the effects of prewhitening on the long wavelength portion of power spectra of atmospheric turbulence. Prewhitening is not recommended when using the narrow spectral windows required for determining power spectral estimates below the 'knee' frequency, that is, at very long wavelengths. Author

N77-12611# Academy of Sciences (USSR), Moscow. Space Research Inst.
ENERGY SPECTRA OF ELECTRONS WITH ENERGIES 3 keV PROBABLY ACCELERATED IN INTERACTION OF THE INJECTED ELECTRON BEAM WITH THE IONOSPHERIC PLASMA IN ARAKS EXPERIMENT
K. I. Gringauz and N. M. Shutte 1976 21 p refs
(D-222) Avail: NTIS HC A02/MF A01

The results of recordings of electrons with 3 keV energies onboard the Eridan rocket during the Araks experiment on January 26, 1975, are reported. The recording instrument was a retarding potential analyzer, data reported were electron energy spectra with energies below 3 keV variation with the altitude. ESA

N77-12612# Academy of Sciences (USSR), Moscow. Space Research Inst.
THE COLD PLASMA THROUGHOUT THE MAGNETOSPHERE
K. I. Gringauz 1976 28 p refs
(D-230) Avail: NTIS HC A03/MF A01

A review of results of the plasmasphere studies and of the cold plasma measurements between plasmapause and magnetopause published mainly from 1974 to 1976 is given. The Prognoz satellites data, which give evidence of quiet plasmasphere asymmetry in the noon-midnight direction, are presented. An inner cold zone (3000 K < ion temperature < 8000 K) and an outer hot zone (8000 K < ion temperature < 100000 K) the thermal structure and dimensions of which depend on geomagnetic activity and its pre-history, exist in the plasmasphere. Cold ion density between the plasmapause and the magnetopause is less than 1/cu cm. The question on coupling between the plasmasphere and regions of enhanced cold plasma density beyond the plasmapause should at present be regarded as unsolved.
Author (ESA)

N77-12613# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany).
AN OVERVIEW OF MAGNETOSPHERIC DYNAMICS
Vytenis M. Vasyliunas Jan. 1976 26 p refs Presented at the Summer Advan. Study School Magnetospheric Particles and Fields, Graz, Aug. 1975
(MPAE-W-100-76-01) Avail: NTIS HC A03/MF A01

Present knowledge of magnetospheric convection and its associated dynamic processes is summarized. Some relevant physical principles, particularly the magnetohydrodynamic approximation and its limits, are reviewed. Processes that can be understood without specific reference to time variations of the magnetosphere are described. Time dependent processes, in particular the magnetospheric substorm, are considered. ESA

N77-12614# Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
MAGNETOSPHERE DYNAMICS BY LOCALIZATION OF ULTRA LOW FREQUENCY WAVES [DYNAMIQUE DE LA MAGNETOSPHERE PAR LOCALISATION D'ONDES U.B.F.]
J. L. Lacoume and F. Glangeaud 24 Feb. 1976 15 p refs In FRENCH Submitted for publication
(CEPHAG-3/76) Avail: NTIS HC A02/MF A01

A discussion is presented concerning the localization of ultra low frequency waves from three receiving earth stations. These experiments would complement GEOS observations in studying the dynamics of the magnetosphere. ESA

N77-12615# European Space Agency, Paris (France).
MEASUREMENT OF GASEOUS MINOR CONSTITUENTS IN THE NATURAL STRATOSPHERE
Marie-Lise Chanin, Raymond Chevalerias, Andre Girard, Olga Lado-Bordowski, Nicole Louisnard, Andre Marten, and Christian Muller Oct. 1976 105 p refs Transl. into ENGLISH of "La Mesure des Constituants Gazeux Minoritaires dans la Stratosphere Naturelle", ONERA, Paris Report ONERA-P-1976-1, 1976 Original report in FRENCH previously announced as N77-10739
(ESA-TT-337; ONERA-P-1976-1; COVOS-1) Avail: NTIS HC A06/MF A01

To determine whether stratospheric aircraft risk dangerously modifying the present condition of the atmosphere, it is necessary to ascertain this condition with a precision comparable to the changes anticipated. The most recent results for each of the so-called gaseous minor constituents are described, after first reviewing the various techniques of measurement which can be used from the ground, from aircraft, and from balloons. It is shown that investigators are already remarkably well-equipped for detecting natural variations and, possibly, variations not arising from natural sources which might affect the principal gases being surveyed. Nonetheless, significant gaps still exist in the present knowledge of stratospheric dynamics and chemistry. The progress needed to fill these gaps, either by improvement of present techniques or development of new ones, is defined.
Author (ESA)

N77-12616# European Space Agency, Paris (France).
DISTORTION OF WEAK SHOCK AND SOUND WAVES BY ATMOSPHERIC TURBULENCE
Roland Stuff Nov. 1976 53 p refs Transl. into ENGLISH of "Einfluss atmosphaerischer Turbulenz auf die Ausbreitung von Schall- u. Stosswellen", DFVLR, Goettingen, West Ger. Report DLR-FB-76-25, 31 Mar. 1976 Original report in GERMAN previously announced as N77-10872 Original German report available from DFVLR, Cologne DM 27.30
(ESA-TT-355; DLR-FB-76-25) Avail: NTIS HC A04/MF A01

Batchelor's theory of single scattering of sound and shock waves is generalized to include the case of a polytropic atmosphere. The influence of atmospheric stratification was investigated by means of a plane shock wave moving vertically downwards in a CIRA standard atmosphere. The shock wave is supposed to enter the atmospheric boundary layer at an altitude of 1000 meters. The scattered waves are distorted by the stratification in the same way as the original wave.
Author (ESA)

N77-12617# Emmanuel Coll., Boston, Mass.
SATELLITE BEACON DATA REDUCTION AND ANALYSIS Final Report, 1 Jan. - 31 Dec. 1975
Eileen Martin MacKenzie, Charles J. Cantor, and M. Patricia Hagan Jan. 1976 40 p
(Contract F19628-75-C-0099; AF Proj. 4643)
(AD-A025329; AFGL-TR-76-0041) Avail: NTIS HC A03/MF A01 CSCL 04/1

Data were reduced and analyses were performed on amplitude and phase scintillation data recorded from VHF and UHF beacons and probe-carrying satellites during magnetic storm periods. Studies were made on the relationship between various parameters and scintillation patterns. GRA

N77-12618# Utah State Univ., Logan. Electro-Dynamics Lab.
INTENSITY VARIATIONS OF ATMOSPHERIC HYDROXYL EMISSIONS
Ronald J. Huppi and Doran J. Baker 1 Jan. 1976 24 p refs (Contract F19628-74-C-0190)
(AD-A025274; AFCRL-TR-76-0032; SR-1) Avail: NTIS HC A02/MF A01 CSCL 04/1

Emissions from excited hydroxyl molecules constitute a significant portion of the near infrared airglow from the night sky. Extensive measurements of the characteristics of these emissions have been made by Utah State University and the Air Force Geophysics Laboratory from an AFGL KC-135 aircraft and from the ground. Observed variations in emission intensities are summarized in this report. The specific types of behavior include: diurnal variations; day-to-day variations; spatial variations associated with auroras; and spatial variations associated with the patchiness of hydroxyl emissions. Some of the variations repeat very regularly while others are more erratic. The presented data are a significant input to infrared phenomenology. GRA

N77-12619# Universidade Tecnica de Lisboa (Portugal).
WEATHERING AND WEATHERABILITY OF ROCKS: EXPERIMENTS ON THERMAL FATIGUE OF NON-IGNEOUS ROCKS Final Technical Report, 30 Sep. 1975 - 31 May 1976
L. Aires-Barros May 1976 26 p refs
(Contract DA-ERO-124-74-G0055; DA Proj. DM1-61102-B-52B)
(AD-A025598) Avail: NTIS HC A03/MF A01 CSCL 08/7

This report presents results of the experiments on crystalline

limestones, and discussions of thermal fatigue of some limestones slates, graywackes and sandstones. Finally, it presents some conclusions and the program to be developed in the next phase of research. GRA

N77-12620*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

A REGION OF INTENSE PLASMA WAVE TURBULENCE ON AURORAL FIELD LINES

D. A. Gurnett and L. A. Frank Apr. 1976 81 p refs Submitted for publication Prepared in cooperation with Max-Planck-Institut fuer Extraterrestrische Physik, Munich

(Contracts NAS1-11257; NAS1-13129; NAS5-20539; NAS5-11074; NAS5-11431; N00014-76-C-0016; Grant NGL-16-001-002)

(NASA-CR-149209; AD-A025227; U-of-Iowa-76-12) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report presents a detailed study of the plasma wave turbulence observed by HAWKEYE-1 and IMP-6 on high latitude auroral field lines and investigates the relationship of this turbulence to magnetic field and plasma measurements obtained in the same region. GRA

N77-12621# Air Force Technical Applications Center, Alexandria, Va.

MEASUREMENT OF OPTICAL POWER RADIATED BY FLORIDA LIGHTNING Final Report

B. N. Turman, T. B. Cummings, and P. R. Deabenderfer Apr. 1976 42 p refs

(AD-A025320; AFTAC-TR-76-7) Avail: NTIS HC A03/MF A01 CSCL 04/2

Optical power from the lightning first return stroke has been measured using silicon and S4 photomultiplier sensors. Absolute source power and temporal characteristics were obtained. Statistical distribution of peak power, time to peak power, and signal duration are presented. Relative power radiated in the following filter bands are also shown: 725--775nm, 776--779nm, and 866--871nm. Results from this experiment are used to estimate lightning trigger rates for conceptual satellite systems with wide and narrow field of view sensors for monitoring lightning phenomena and thunderstorm activity. Author (GRA)

N77-12622# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.

SHORT-PERIOD P WAVE ATTENUATION ALONG VARIOUS PATHS IN NORTH AMERICA AS DETERMINED FROM P WAVE SPECTRA OF THE SALMON NUCLEAR EXPLOSION Technical Report, 1 Jul. 1975 - 30 Jun. 1976

Zoltan A. Der and Thomas W. McElfresh 15 Sep. 1975 66 p refs

(Contract F08606-76-C-0004; ARPA Order 1620)

(AD-A025239; SDAC-TR-75-16) Avail: NTIS HC A04/MF A01 CSCL 08/11

Average Q values were determined for ray paths to various LRSM stations from the SALMON nuclear explosion, which was located in a salt dome in Mississippi, by taking ratios of observed P wave spectra to that of the estimated source spectrum. Most average Q values for the SALMON P wavepaths throughout eastern North America are close to 2000 while those with the last half of their path in the western United States are typically around 400-500. These differences in Q seem to be sufficient to explain the .3-.4 magnitude differences in the teleseismic event magnitude observed in the western vs. eastern United States. Author (GRA)

N77-12623# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

LOW FREQUENCY WAVE-REFLECTION PROPERTIES OF THE EQUATORIAL IONOSPHERE

John E. Rasmussen, Edward A. Lewis, Paul A. Kossey, Reginaldo DosSantos (Centro Tecnico Aerospacial, Brazil), Edsel DeFreitas Coutinho (Centro Tecnico Aerospacial, Brazil), Royce C. Kahler (Centro Tecnico Aerospacial, Brazil), and Wayne I. Klemetti (Barkeley and Dexter Labs., Fitchburg, Mass.) 3 Dec. 1975 65 p refs

(AF Proj. 4603)

(AD-A025111; AFCRL-TR-75-0615; AFCRL-ERP-542) Avail: NTIS HC A04/MF A01 CSCL 04/1

A joint United States-Brazil experiment was conducted near the geomagnetic equator to confirm the theoretically predicted strong dependence of the ionospheric reflection properties on the azimuthal direction of wave propagation. Skywave delays, reflection coefficients, and polarization ellipses were measured at different frequencies, ranges, and azimuths. The results were compared with full-wave computer calculations for several ionospheric models. A series of high resolution waveforms showing the sunrise transition from night- to daytime conditions is included. GRA

N77-12624# Mission Research Corp., Santa Barbara, Calif.

A UNIVERSAL IMPEDANCE FOR SOILS Topical Report, 1 Jul. - 30 Sep. 1975

Conrad L. Longmire and Ken S. Smith Oct. 1975 27 p refs

(Contract DNA001-75-C-0094; DNA Proj. NWED-QAXEA094)

(AD-A025759; MRC-N-214; DNA-3788T) Avail: NTIS HC A03/MF A01 CSCL 08/13

A set of universal formulae are proposed for the dielectric constant and conductivity of soils over the frequency range 5 Hz to 3 x 10 to the 10th power Hz. These formulae are based on an RC network model, with parameters adjusted to fit Scott's data for soils and Wilkenfeld's data for some concrete and grout samples. GRA

N77-12625# Ballistic Research Labs., Aberdeen Proving Ground, Md.

THE CLUSTERING OF O2 AND He TO Li(+) Final Report

L. M. Colonna-Romano and G. E. Keller May 1976 12 p refs

(DA Proj. 1T1-61102-B-53A)

(AD-A025762; BRL-1882) Avail: NTIS HC A02/MF A01 CSCL 07/2

The clustering of oxygen and helium to positive lithium ions has been studied using a drift tube-mass spectrometer at 319K. For oxygen clustering, the rate coefficients for cluster ion formation and collisional dissociation were measured as a function of E/N. For clustering to helium, only an equilibrium constant was determined. The relative importance of the clustering of several atmospheric gases to positive lithium ions in the ionosphere is discussed. GRA

N77-12626# Ohio State Univ., Columbus. Dept. of Geodetic Science.

COVARIANCE EXPRESSIONS FOR SECOND AND LOWER ORDER DERIVATIVES OF THE ANOMALOUS POTENTIAL

C. C. Tscherning Jan. 1976 68 p refs

(Contract F19628-76-C-0010; AF Proj. 7600)

(AD-A024720; DGS-225; AFGL-TR-76-0052; SR-2) Avail: NTIS HC A04/MF A01 CSCL 08/5

Auto-and cross-covariance expressions for the anomalous potential of the earth and its first and second order derivatives are derived based on three different degree-variance models. A FORTRAN 4 subroutine is listed and documented that may be used for the computation of auto- and cross-covariance between any of the following quantities: (1) the anomalous potential (T), (2) the negative gravity disturbance/r, (3) the gravity anomaly (delta g), (4) the radial component of the gradient of delta g, (5) the second order radial derivative of T, (6), (7) the latitude and longitude components of the deflection of the vertical, (8), (9) the derivatives in northern and eastern direction of delta g, (10), (11) the derivatives of the gravity disturbance in northern and eastern direction, (12)-(14) the second order derivatives of T in northern, in mixed northern and eastern and in eastern direction. Values of different kinds of covariance of second order derivatives for varying spherical distance and height are tabulated. GRA

N77-12627# Lincoln Lab., Mass. Inst. of Tech., Lexington.

SEISMIC DISCRIMINATION Semiannual Technical Summary Report, 1 Jul. - 31 Dec. 1975

Michael A. Chinnery 31 Dec. 1975 89 p refs

(Contract F19628-76-C-0002; ARPA Order 512)

(AD-A025777; ESD-TR-75-335) Avail: NTIS HC A05/MF A01 CSCL 17/10

The report describes 23 investigations in the field of seismic discrimination. These are grouped as follows: Estimation of magnitude by networks and single stations (6 contributions);

studies relating to earth structure and scattering processes (7 contributions); studies in focal depth determination, source mechanism discrimination, and general seismology (6 contributions); and recent developments in computer systems and software for seismic data processing (4 contributions). GRA

N77-12628# Calcutta Univ. (India). Inst. of Radio Physics and Electronics.
INVESTIGATIONS ON IONOSPHERIC ELECTRON CONTENT AND ELECTRON DENSITY IRREGULARITIES AT LOW LATITUDES WITH GEOSTATIONARY SATELLITES Final Scientific Report, 1 Jan. 1971 - 31 Dec. 1975
J. N. Bhar, S. Basu, A. DasGupta, B. K. Guhathakurfa, and G. N. Bhattacharyya 2 Jan. 1976 171 p refs
(Grant AF-AFOSR-2142-71; AF Proj. 4643)
(AD-A024957; AFGL-TR-76-0110) Avail: NTIS HC A08/MF A01 CSCL 20/14

The report embodies the results of continuous measurements of ionospheric electron content and scintillations obtained for the first time with a geostationary satellite over the Indian subcontinent. The observations near the crest of the equatorial anomaly indicate the importance of plasma transport in the equatorial ionosphere. Solar and geomagnetic controls also show some interesting features. It has been observed that though the occurrence of scintillation is very low, there may be cases of intense scintillations even at a frequency of 136 MHz. Scintillation in this region has been found to be induced by both E and F regions. Author (GRA)

N77-12629# Utah State Univ., Logan. Space Science Lab.
GEOMETRIC ASPECTS OF ROCKET PHOTOMETRY Interim Report
William F. Grieder and Leo A. Whelan (Logicon, Inc., Torrance, Calif.) Feb. 1976 111 p refs
(Contract F19628-74-C-0130; DNA Proj. NWET-K43AAXHX604)
(AD-A024947; HAES-41; AFGL-TR-76-0046; SR-3) Avail: NTIS HC A06/MF A01 CSCL 17/5

This report describes the derivation and application of a technique to transform oblique rocket photometric measurements of emission phenomena to vertical altitude (Zenith) profiles and the subsequent derivation of volume emission rates. The van Rhijn method of aspect correction is analyzed including limitations of the method when applied to D and E region emission measurements. A theoretical study is presented in which the general rocketborne photometer geometry is solved for a set of practical volume emission rate cases. The study definitizes the effects of finite fields of view, system directional responsivity and extinction on interpretation of measured emission data and derived volume emission rates. The results of the theoretical study are applied to an actual photometric measurement accomplished on rocket A17.110-3 flown from Poker Flat Rocket Range in Alaska on 16 March 1972. Zenith profiles are derived from oblique hydroxyl emission measurements in the band 1.67 to 1.90 micrometers band made at 60, 70, and 80 deg zenith angle as the rocket ascended. Volume emission rates deduced from these zenith profiles are consistant with results reported in the literature. Author (GRA)

N77-12630# Lowell Univ. Research Foundation, Mass.
DIGITAL IONOSPHERIC SOUNDING IN SUPPORT OF ARCTIC RESEARCH Final Report, 1 Jul. 1974 - 30 Sep. 1975
Klaus Bibl, Bodo W. Reinisch, and Sheryl Smith Jan. 1976 69 p
(Contract F19628-75-C-0015; AF Proj. 7663)
(AD-A024706; ULRF-377/IP; AFCRL-TR-76-0037) Avail: NTIS HC A04/MF A01 CSCL 04/1

Digital acquisition of ionospheric data in arctic regions was carried out by two Digisondes, one in Goose Bay, Labrador, the other aboard AFCRL'S KC-135 aircraft. New digital display methods were incorporated in these systems. The hourly ionograms from Goose Bay for March 1974 to February 1975 were reduced and monthly median curves presented. Development of a new Automatic Ionogram Reduction (AIR6) computer program reduced data storage requirements by a factor of 10. Up to six echoes, two in the E-region and four in the F-region, are detected for each frequency in the ionogram. Amplitudes, heights and echo spread are retrieved together with the noise for each frequency. A pulse matching technique increases the height accuracy by a factor of three compared to the original digital ionogram. For on-line operation a hardware system, the AIC6, was designed using micro-processor techniques. GRA

N77-12631# Edgewood Arsenal, Aberdeen Proving Ground, Md.
AEROSOL SPECTROSCOPY IN THE INFRARED
Hugh R. Carlon and David H. Anderson 1976 15 p refs
(AD-A025985) Avail: NTIS HC A02/MF A01 CSCL 04/1

Aerosol spectroscopy is a new field confronted with placing in proper perspective a large body of existing popular 'fact' which has its basis primarily aerosol scattering behavior while it ignores aerosol absorption and emission contributions in the infrared. Effects such as aerosol absorption and probable luminescence must be understood before atmospheric modeling, particularly in and near the 8-13 micrometer atmospheric 'window' through which most of the earth's radiative transfer takes place, can be completed. Many unexplained atmospheric phenomena should become understandable through precise modeling. GRA

N77-12632# National Oceanic and Atmospheric Administration, Boulder, Colo.
THE RADIATION AND ENERGY BUDGETS OF THE EARTH USING BOTH GROUND-BASED AND SATELLITE-DERIVED VALUES OF TOTAL CLOUD COVER
Douglas V. Hoyt Apr. 1976 130 p refs
(PB-256756/8; NOAA-TR-ERL-362; ARL-4; NOAA-76060103)
Avail: NTIS HC A07/MF A01 CSCL 04A

The radiation and energy budgets of the earth are calculated for two models of the cloud cover, one based on observations made at the earth's surface and one deduced from satellite observations. The albedo, outgoing terrestrial radiation, global solar radiation at the earth's surface, evaporation, and precipitation are among the many parameters calculated. GRA

N77-12633# National Bureau of Standards, Washington, D.C.
CHEMISTRY IN THE STRATOSPHERE Final Report
D. Garvin, E. S. Domalski, R. F. Hampson, and D. D. Wagman Sep. 1975 31 p refs Repr. from Nat. Stratosphere of 1974, CIAP Monograph 1, Chpt. 5, 1975 28 p
(PB-255862/5; DOT-TST-75-51) Avail: NTIS HC A03/MF A01 CSCL 04A

Work was done (1) to illustrate the problems to be solved in unraveling the chemistry of the stratosphere and (2) to provide the quantitative data needed when chemical reactions are introduced into numerical modeling of the stratosphere. The topics discussed in this chapter, their pertinence to the stratosphere and some principal conclusions are described. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N77-12634*# ECON, Inc., Princeton, N.J.
A PLAN FOR APPLICATION SYSTEM VERIFICATION TESTS: THE VALUE OF IMPROVED METEOROLOGICAL INFORMATION, VOLUME 1 Final Report
31 Aug. 1976 168 p refs
(Contract NASw-2558)
(NASA-CR-149210) Avail: NTIS HC A08/MF A01 CSCL 04B

The framework within which the Applications Systems Verification Tests (ASVTs) are performed and the economic consequences of improved meteorological information demonstrated is described. This framework considers the impact of improved information on decision processes, the data needs to demonstrate the economic impact of the improved information, the data availability, the methodology for determining and analyzing the collected data and demonstrating the economic impact of the improved information, and the possible methods of data collection. Three ASVTs are considered and program outlines and plans are developed for performing experiments to demonstrate the economic consequences of improved meteorolog-

ical information. The ASVTs are concerned with the citrus crop in Florida, the cotton crop in Mississippi and a group of diverse crops in Oregon. The program outlines and plans include schedules, manpower estimates and funding requirements. Author

N77-12635*# ECON, Inc., Princeton, N.J.
A PLAN FOR APPLICATION SYSTEM VERIFICATION TESTS: THE VALUE OF IMPROVED METEOROLOGICAL INFORMATION, VOLUME 2 Final Report
31 Aug. 1976 231 p refs
(Contract NASw-2558)
(NASA-CR-149169) Avail: NTIS HC A11/MF A01 CSCL 04B

For abstract, see N77-12634.

N77-12636*# ECON, Inc., Princeton, N.J.
A PLAN FOR APPLICATION SYSTEM VERIFICATION TESTS: THE VALUE OF IMPROVED METEOROLOGICAL INFORMATION, EXECUTIVE SUMMARY Final Report
31 Aug. 1976 40 p 3 Vol.
(Contract NASw-2558)
(NASA-CR-149168) Avail: NTIS HC A03/MF A01 CSCL 04B

For abstract, see N77-12634.

N77-12637*# Ocean Data Systems, Inc., Rockville, Md.
PECHCV, PECHFV, PEFHCV AND PEFHFV: A SET OF ATMOSPHERIC, PRIMITIVE EQUATION FORECAST MODELS FOR THE NORTHERN HEMISPHERE, VOLUME 3 Final Report
Robert E. Wellck and Melvin L. Pearce Jul. 1976 134 p refs Prepared in cooperation with ECON, Inc., Princeton, N. J.
(Contract NASw-2558)
(NASA-CR-149027) Avail: NTIS HC A07/MF A01 CSCL 04B

As part of the SEASAT program of NASA, a set of four hemispheric, atmospheric prediction models were developed. The models, which use a polar stereographic grid in the horizontal and a sigma coordinate in the vertical, are: (1) PECHCV - five sigma layers and a 63 x 63 horizontal grid, (2) PECHFV - ten sigma layers and a 63 x 63 horizontal grid, (3) PEFHCV - five sigma layers and a 187 x 187 horizontal grid, and (4) PEFHFV - ten sigma layers and a 187 x 187 horizontal grid. The models and associated computer programs are described. Author

N77-12638*# Alabama Univ., Huntsville.
REVIEW STUDY AND EVALUATION OF POSSIBLE FLIGHT EXPERIMENTS RELATING TO CLOUD PHYSICS EXPERIMENTS IN SPACE Final Report
R. J. Hunt and S. T. Wu Oct. 1976 55 p refs
(Contract NAS8-30247)
(NASA-CR-150066; UAH-RR-193) Avail: NTIS HC A04/MF A01 CSCL 04B

The general objectives of the Zero-Gravity Atmospheric Cloud Physics Laboratory Program are to improve the level of knowledge in atmospheric cloud research by placing at the disposal of the terrestrial-bound atmospheric cloud physicist a laboratory that can be operated in the environment of zero-gravity or near zero-gravity. This laboratory will allow studies to be performed without mechanical, aerodynamic, electrical, or other techniques to support the object under study. The inhouse analysis of the Skylab 3 and 4 experiments in dynamics of oscillations, rotations, collisions and coalescence of water droplets under low gravity-environment is presented. Author

N77-12639*# Tennessee Univ. Space Inst., Tullahoma.
TURBULENT ATMOSPHERIC FLOW OVER A BACKWARD-FACING STEP Final Report
U. K. Kaul and Walter Frost Washington NASA Oct. 1976 185 p refs
(Contract NAS8-29584)
(NASA-CR-2749; M-179) Avail: NTIS HC A09/MF A01 CSCL 04B

The phenomenon of atmospheric shear layer separation over a man-made structure such as a building (modeled as a backward-facing step) has been analyzed theoretically by (1) solving the two-dimensional equations of motion in the two variables, stream function and vorticity, and by (2) employing an approximate integral technique. Boundary conditions for the undisturbed flow are that of the turbulent atmospheric shear flow over a rough terrain. In the first approach a two-equation model of turbulence was used. In the second approach an approximate technique was utilized in an attempt to describe the details of the flow in the recirculation zone behind the step. The results predict velocity profiles in sufficient detail that the presence of the corner eddy in the region of negative surface pressure gradient is evident. The magnitude of the reversed flow velocity in the recirculation eddy has been found to agree with that found from experiments. Also, a surface eddy viscosity distribution has been an outgrowth of the method which realistically follows the magnitude of the surface pressure gradient distribution as found experimentally. Author

N77-12640# World Meteorological Organization, Geneva (Switzerland).
APPLICATION OF BUILDING CLIMATOLOGY TO THE PROBLEMS OF HOUSING AND BUILDING FOR HUMAN SETTLEMENTS
J. K. Page 1976 80 p refs
(WMO-441; TN-150; ISBN-92-63-10441-7) Avail: NTIS HC A05/MF A01

Following an outline of the general scope of building climatology, a detailed analysis of the meteorologist's contribution to the improvement of the safety of buildings exposed to weather extremes is provided. Systematic processes for harnessing meteorological data into the actual building design and construction process are described. Physical environmental criteria for assessing human needs in and around buildings are detailed. ESA

N77-12641# Deutscher Wetterdienst, Offenbach am Main (West Germany).
ANNALS OF METEOROLOGY NO. 10: DEVELOPMENT OF METEOROLOGICAL OBSERVATIONS IN NORTHERN AND CENTRAL GERMANY UP TO 1700
Fritz Klemm 1976 74 p refs In GERMAN
(ISBN-3-88148-145-1) Avail: NTIS HC A04/MF A01

A collection of material relating to meteorological observations is presented. The oldest known weather observations date back to 1553. The material may serve as a basis for determining long term climatic variations. ESA

N77-12642# Danish Meteorological Inst., Copenhagen. Ionosphere Lab.
AUTOMATIC METEOROLOGICAL OBSERVATIONS IN NORTHERN GREENLAND
P. Dorph-Petersen, G. Jensen, J. Taagholt, L. Kristensen, N. WoetmannNielsen, and L. Rasmussen 1976 19 p refs
(P-62) Avail: NTIS HC A02/MF A01

Experiences from four years of operation of battery driven unmanned geophysical observatories (UGO) for measurement of air temperature, soil temperature, dew point, pressure, wind speed, and direction are discussed. By 1976, six stations were supplied with UGO equipment in operation: Nord, Kap Harald Moltke, Kap Morris Jesup, Hall Land, Daneborg, and Carey Islands. Apart from difficulties with over-icing of the wind sensors and temperature drift of the barometers, several years of almost unbroken data records have made it possible to reanalyze weather maps. These reanalyses show that more operational synoptic stations are needed in the northern parts of Greenland. Author (ESA)

N77-12643# Royal Netherlands Meteorological Inst., De Bilt.
MARINE CLIMATOLOGICAL SUMMARIES FOR THE MEDITERRANEAN AND SOUTHERN INDIAN OCEAN, VOLUME 6, 1966
1976 489 p
(KNMI-151-6) Avail: NTIS HC A21/MF A01; Roy. Neth. Meteorol. Inst. DFI 25

Tables give the following information for the year 1966: mean monthly positions of observations; map of area; cloud amount; dry-bulb temperature; dew-point temperature; sea-surface temperature; air-sea temperature difference; wind; atmospheric pressure at sea level; horizontal visibility; and present weather and waves. ESA

N77-12644# Royal Netherlands Meteorological Inst., De Bilt.
MARINE CLIMATOLOGICAL SUMMARIES FOR THE MEDITERRANEAN AND SOUTHERN INDIAN OCEAN, VOLUME 7, 1967
1976 492 p
(KNMI-151-7) Avail: NTIS HC A21/MF A01; Roy. Neth. Meteorol. Inst. DFI 25

Tables give the following information for the year 1967: mean monthly position of observations; map of area; cloud amount; dry-bulb temperature; dew-point temperature; sea-surface temperature; air-sea temperature difference; wind; atmospheric pressure at sea-level; horizontal visibility; and present weather and waves. ESA

N77-12645# Royal Netherlands Meteorological Inst., De Bilt.
YEARBOOK A, NO. 126: METEOROLOGY, 1974
1975 76 p In ENGLISH and DUTCH
(KNMI-97-126) Avail: NTIS HC A05/MF A01; Roy. Neth. Meteorol. Inst. DFI 17.50

Results are presented of observations made at 46 meteorological stations in the Netherlands during 1974. Tables provide the following data: air pressure, wind direction, wind velocity, temperature, relative humidity, vapor pressure, global radiation, sunshine, and amount of precipitation. ESA

N77-12646# Royal Netherlands Meteorological Inst., De Bilt.
CLIMATOLOGICAL DATA OF NETHERLANDS STATIONS. VOLUME 9: TABLES WITH DATA OF AERODROMES AMSTERDAM/SCHIPHOL, EINDHOVEN/EINDHOVEN, ENSCHEDE/TWENTE, GRONINGEN/EELDE, MAASTRICHT/ZUID-LIMBURG AND ROTTERDAM/ROTTERDAM ACCORDING TO OBSERVATIONS IN THE PERIOD 1955 - 1970
1976 266 p In ENGLISH and DUTCH
(KNMI-150-9) Avail: NTIS HC A12/MF A01; Roy. Neth. Meteorol. Inst. DFI 27.50

Meteorological data of airport weather stations recorded in the period 1955 to 1970 are represented in tabular form. The following data are given: occurrence of concurrent wind speed; wind direction, horizontal visibility, and lowest cloud-layer dependence; mean surface temperature; mean atmospheric pressure; occurrence of horizontal visibility; comparison between horizontal visibility and lowest cloud layer covering more than 1/2 of the sky; cross wind components; head wind components; tail wind components; and occurrence of the most important weather types. ESA

N77-12647# Arizona Univ., Tucson. Lab. of Tree-Ring Research.
RECONSTRUCTION OF PAST CLIMATIC VARIABILITY Final Report, 30 Jun. 1972 - 30 Sep. 1975
Harold C. Fritts, T. J. Blasing, E. DeWitt, G. R. Lofgren, K. B. McDougall, D. J. Shatz, J. A. Sherwood, D. W. Stevens, C. L. Winter, and M. A. Wiseman 1 Mar. 1976 161 p refs
(Grant AF-AFOSR-2406-72; ARPA Order 2221)
(AD-A024276; AFOSR-76-0509TR) Avail: NTIS HC A08/MF A01 CSCL 04/2

The following are among the achievements made during the first 3 years of a 5-year project to reconstruct past climatic fluctuations in the Northern Hemisphere from variations in the growth rings of trees: (1) Growing international collaboration stimulated by this research effort; (2) Development of 127 high-quality tree-ring chronologies from North America and Europe; (3) The establishment of the International Tree-Ring Data Bank; (4) Evaluation of multivariate techniques for calibration and analysis; and (5) The selection of a revised data set for reconstructing North American climate. These results will be used to improve reconstructions of past climate and to expand them to eastern North America and Europe. GRA

N77-12648# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
HEAT AND THRUST REQUIREMENTS OF A THERMAL FOG DISPERSAL SYSTEM Air Force Surveys in Geophysics
Bruce A. Kunkel 5 Sep. 1975 43 p refs
(AF Proj. 7605)
(AD-A025112; AFCRL-TR-75-0472; AFCRL-AFSG-322) Avail: NTIS HC A03/MF A01 CSCL 04/2

Field tests were conducted with a subscale momentum/heat system, to determine the optimum heat and thrust requirements and combustor positions for a full scale thermal fog dispersal system. The site, located in Irvine, California, was laid out on a 1/6 scale. The Froude number scaling law was used to scale up to full scale. An array of 65 thermistors and 6 wind sensors was located in the target area over a simulated runway. Wind and temperature sensors were also located outside of the target area to provide background measurements during the tests. Tests were conducted at night, in clear air, during calm conditions. Both momentum and passive heat systems are evaluated in terms of heat and thrust requirements for different wind conditions. A single line momentum/heat system requires 5 to 10 times as much thrust as does a two-side-of-the-runway system. A passive system requires anywhere from 130-470 percent more heat output than does a momentum system. The appropriate system for a particular airfield can only be determined after a cost analysis has been made of the various systems and a wind study has been made of the particular airfield. GRA

N77-12649# Emmanuel Coll., Boston, Mass.
LIGHTNING STRIKE WARNINGS FOR TETHERED BALLOON OPERATIONS Scientific Report, 15 Jan. 1975 - 29 Feb. 1976
Eileen Martin Mackenzie and Alan G. Johnston Apr. 1976 39 p ref
(Contract F19628-74-C-0039; AF Proj. 6665)
(AD-A025486; AFGL-TR-76-0095; SR-1) Avail: NTIS HC A03/MF A01 CSCL 01/3

Lightning-warning data was taken during the 1974 thunderstorm season at Holloman AFB, N.M. using a GCA Model EL-300 Lightning-Warning Set. A computer program was then written to analyze this data in order to optimize the choice of warning criteria to be established in using the Lightning-Warning Set for tethered balloon operations at Holloman AFB. This report provides a discussion of the various criteria which were employed in the computer program in order to provide a one hour and a 5 minute warning of an impending electrical hazard. From these various criteria one was chosen which provided a minimum number of hours under false warnings and a minimum number of hazardous conditions without warnings. GRA

N77-12650# Naval Postgraduate School, Monterey, Calif.
TURBULENT FLUX ESTIMATES FROM SHIPBOARD MEAN WIND AND TEMPERATURE PROFILES AND DISSIPATION RATES M.S. Thesis
Harvey Eugene Atkinson, III Mar. 1976 67 p refs
(AD-A025438) Avail: NTIS HC A04/MF A01 CSCL 04/2

Height profiles of mean wind speed and wind velocity fluctuation spectra are derived from observations made aboard the R/V Acania while anchored in Monterey Bay. The profiles and spectra in conjunction with related temperature fluctuation data obtained in a parallel study are used to calculate the atmospheric boundary layer turbulence parameters: friction velocity, drag coefficient, vertical heat flux and z/L. A general disagreement of the results of this study with each other and with previously published results is inconclusive due to small size of the data base. The best agreement with results of other studies was with the calculation of the drag coefficient using velocity fluctuation data. Author (GRA)

N77-12651# California Univ., Los Angeles. Dept. of Meteorology.
SOME ASPECTS OF THE INFLUENCE OF ABNORMAL EASTERN EQUATORIAL PACIFIC OCEAN SURFACE TEMPERATURES UPON WEATHER PATTERNS IN THE SOUTHWESTERN UNITED STATES, VOLUME 2 Final Report, Dec. 1972 - Dec. 1975
Charles B. Pyke Dec. 1975 145 p refs
(Contract N00014-75-C-0262; NR Proj. 083-287)
(AD-A024710) Avail: NTIS HC A07/MF A01 CSCL 04/2

The theories of the late Dr. J. Bjerknes concerning the influence of an abnormally warm equatorial Pacific Ocean upon weather patterns in the southwestern United States are investigated further. Atmospheric circulation and precipitation patterns during the equatorial warm-water seasons of 1957-1958 and 1972-1973 are compared to those of earlier seasons of this type. These examples further confirm Bjerknes' theory

that a warm equatorial Pacific Ocean is associated with a strong subtropical jet stream and repeated moderate to heavy storminess over the southwestern United States during winter and spring. In Northern Hemisphere winters of cooler than normal or rapidly cooling equatorial Pacific water, large-amplitude ridges will at times form over the northeastern Pacific, bringing cold storminess and heavy snowfall, or warm and very heavy rainfall, to parts of the southwestern United States. Some historical examples of these types of patterns are discussed. Summer and early fall precipitation over the southwestern United States, especially tropical cyclone rainfall and intense local storms, are also related--indirectly--to warm anomalies in the equatorial Pacific Ocean. Some hydrologic applications of the relationships between precipitation and equatorial ocean temperatures are discussed, and the possibilities of seasonal forecasting are also briefly mentioned. GRA

N77-12652# Naval Weather Service Command, Washington, D.C.
US NAVAL WEATHER SERVICE NUMERICAL ENVIRONMENTAL PRODUCTS MANUAL
1 Jun. 1975 368 p refs
(AD-A024702; NAVAIR-50-1G-522) Avail: NTIS HC A16/MF A01 CSCL 04/2

The numerical environmental products available from the Naval Weather Service require adequate documentation if their full potential is to be realized. These products consist of a variety of analyses and predictions of the air-sea environment. This publication is issued for the information and guidance of users of the products. The following topics are discussed: Use of computer products in the synoptic forecast routine; Techniques and tools common to Navy products; Atmospheric program descriptions; Oceanographic program descriptions; Products from other activities. GRA

N77-12653# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
CHEMICAL RELEASE TRIANGULATION AND WINDS IN THE ALTITUDE RANGE 93 km TO 176 km Interim Report, Oct. 1973 - Jun. 1974
Robert G. Roper and Howard D. Edwards Mar. 1976 17 p
(Contract F19628-74-C-0085)
(AD-A024952; AFGL-TR-76-0063; SR-2) Avail: NTIS HC A02/MF A01 CSCL 04/2

This report is divided into two sections. The first deals with the reduction and tabulation of chemical release position data, which is used subsequently to interpret spectral energy measurements made of the releases. The second section treats the tabulation and plotting of data delineating neutral wind motions. Tables are presented which give the position, and the time history, of the centers of puffs of vaporized chemicals released by three rockets in the lower thermosphere. Two of these, plus an additional trail release were further reduced, to produce both tables and graphs of the variation of wind speed with altitude. Negative wind and shear components indicate winds and shears toward the south and west. Wind headings are given in degrees east of north. Vertical winds are in meters/sec., and are positive upwards. Author (GRA)

N77-12654# Ocean Data Systems, Inc., Monterey, Calif.
DATA ASSIMILATION RESTORATIVE-ITERATIVE MODEL (RIMOD) Final Technical Report, Nov. 1974 - Nov. 1975
Philip G. Kesel and Robert E. Wellck Nov. 1975 62 p refs
(Contract N00228-75-C-2120)
(AD-A024736; ODSI-694; NEPRF-TR-13-75(ODSI)) Avail: NTIS HC A04/MF A01 CSCL 04/2

The complex, multi-layer, atmospheric prediction model, PEM76, was redesigned for studying geostrophic adjustment (dynamic initialization) and satellite-data assimilation using 'orbital' integration techniques tested in simple primitive-equation models by Mesinger (1972) and Temperton (1973). The utility and computational expense of such dynamic initialization, which is a procedure for preparing a stabilized model context for data sensitivity tests, is examined using several model versions. Comparative performance data are presented in terms of statistical measures of model parameters (kinetic energy, velocity divergence, vertical motion, vorticity). GRA

N77-12655# Army Electronics Labs., Fort Monmouth, N.J.
SYNOPTIC THERMAL WIND CALCULATIONS FROM RADIOSONDE OBSERVATIONS OVER THE SOUTHWESTERN UNITED STATES
Young P. Yee, James D. Horn, and George D. Alexander May 1976 42 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A025693; ECOM-5592) Avail: NTIS HC A03/MF A01 CSCL 04/2

Thermal wind calculations from radiosonde (raob) measurements over the Southwestern United States were verified for three atmospheric layers: 300-100 mb, 100-50 mb, 50-20 mb. Sixteen radiosonde station pairs were chosen, and readings were taken in July and August 1973 and January and February 1974 at 0000Z. A correlation analysis was done on the calculated thermal wind versus the average measured wind shears. Results were good at the 100-50 mb layer; but jet stream activity was a factor at the 300-100 mb layer, and radiosonde balloon drift was a possible factor affecting the 50-20 mb layer. Generally, the thermal winds had comparatively larger absolute values than the corresponding measured wind shears. Inherent errors in the procedure employed were discussed, and recommendations for further study of apparent problems were made. Author (GRA)

N77-12656# Hawaii Univ., Honolulu. Dept. of Meteorology.
TROPICAL CYCLONE INITIATION BY THE TROPICAL UPPER TROPOSPHERIC TROUGH
James C. Sadler Feb. 1976 93 p refs
(Contract N66314-73-C-1770)
(AD-A025456; UHMET-75-02; NEPRF-TP-2-76) Avail: NTIS HC A05/MF A01 CSCL 04/2

Improved satellite observations and an increased quantity of aircraft wind observations are meshed for case studies to modify the earlier synoptic model of tropical cyclone initiation by the Tropical Upper Tropospheric Trough (TUTT). The major modification is in the vertical linkage between the upper and lower cyclonic systems. In the previous model (Sadler, 1967) it was proposed that the surface system resulted from a sloping downward penetration of the strong TUTT cell and, due to the slope, the surface disturbance was properly positioned under the upper divergence for intensification. These current studies show that the TUTT cell does not penetrate into the near surface layer but that the surface disturbance is induced by the upper divergence to the east of the TUTT cell and the two systems are initially separated by some 300 to 500 km. The better observations also permit a more detailed description of the upper circulation patterns to show how the convection associated with the intensifying surface system 'kill' the parent TUTT cell. Author (GRA)

N77-12657# National Oceanic and Atmospheric Administration, Washington, D.C. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL HURRICANE OPERATIONS PLAN
May 1976 111 p
(PB-256824/4; FCM-76-1; NOAA-76051205) Avail: NTIS HC A06/MF A01 CSCL 04B

The report is the 14th edition and presents the procedures and agreements reached at the annual interdepartmental Hurricane Warning Conference (combined Atlantic and Pacific). This Conference was sponsored by the Subcommittee on Basic Meteorological Services, Interdepartmental Committee for Meteorological Services, to bring cognizant Federal agencies to achieve agreement on items of mutual concern related to Atlantic and Pacific hurricane warning services. GRA

N77-12658# National Oceanic and Atmospheric Administration, Washington, D.C. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL SEVERAL LOCAL STORMS OPERATION PLAN
Apr. 1976 46 p
(PB-256717/0; NOAA-S/T-76-2782; FCM-76-2;
NOAA-76052104) Avail: NTIS HC A03/MF A01 CSCL 04B

The report is the ninth of an annual series of National Severe Local Storms Operations Plans that was developed after a 1976 request by the Federal Coordinator for Meteorological Services and Supporting Research. The plan outlines the responsibilities

of the various United States agencies which provide meteorological services in observing and forecasting severe local storms. GRA

N77-12659# National Oceanic and Atmospheric Administration, Washington, D.C. Environmental Data Service.
MARINERS WEATHER LOG, VOLUME 20, NUMBER 3, MAY 1976
Elwyn E. Wilson May 1976 71 p
(PB-250014-03; NOAA-76052105-Vol-20-No-3) Avail: NTIS HC A04/MF A01 CSCL 04B

This publication discusses marine environments in general. A weather log is included with recorded data of weather activity. Tropical cyclone activity over the Eastern North Pacific in 1975 is detailed. The major topics are tropical cyclones in the Eastern North Pacific; hypothermia and cold water survival; and Great Lakes navigation season, 1975. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N77-12660 Arizona Univ., Tucson.
PAST AIR-SEA INTERACTIONS OVER THE EASTERN NORTH PACIFIC OCEAN AS REVEALED BY TREE-RING DATA Ph.D. Thesis
Arthur Vern Douglas 1976 209 p
Avail: Univ. Microfilms Order No. 76-22485

Sea surface temperature (SST) data which are reflective of air-sea interactions are available for the periods 1924 to 1940 and 1949 to 1972. To augment this short term data, reconstructions of SST data are made using climatically sensitive tree-ring data. The reconstructed SST data are determined to have an 83% accuracy in predicting SST extremes during the noncalibration periods: pre-1924 and 1941 to 1948. The reconstructed SST anomalies are in agreement with historical SST data from off central California during the 1800's and early 1900's. Examination of the reconstructed SST reveals that the period 1671 to 1800 was typified by warm winter SST and cool summer SST. By the early 1800's, summers became anomalously warm off Baja California, and this summer warming climaxed in the 1840's and 1850's. Warm summer waters are conducive to the movement of tropical storms and depressions into the southwestern United States, resulting in above normal precipitation in the late summer and early fall. Dissert. Abstr.

N77-12661 California Univ., San Diego.
BOUNDING THE THICKNESS OF THE OCEANIC MAGNETIZED LAYER Ph.D. Thesis
Stephen Porter Huestis 1976 118 p
Avail: Univ. Microfilms Order No. 76-22013

A method is presented for determing a lower bound on the thickness of the oceanic magnetized layer from a finite number of magnetic anomaly measurements, under the assumptions of two-dimensionality and known magnetization direction. Confining the source to a constant thickness layer following the bathymetry, the magnetization intensity of the ideal body (that solution with the smallest possible maximum magnetization of all solutions fitting the data) is calculated as a function of layer thickness. For this curve a lower bound on the thickness is determined by assuming an upper bound on the magnetization intensity in the layer. By partitioning the layer into small prismatic cells, each of uniform magnetization, the revised simplex algorithm of linear programming can be used to calculate the approximate ideal body shape and magnetization. For a two data case, the linear programming solution is found to be in excellent agreement with the analytic solution. Dissert. Abstr.

N77-12662# Deutsches Hydrographisches Institut, Hamburg (West Germany).
RESEARCH SHIP METEOR OF THE GERMAN RESEARCH SOCIETY AND THE GERMAN HYDROGRAPHICAL INSTITUTE. VOYAGE NO. 35 (21 OCTOBER - 21 NOVEMBER 1974) NORTH SEA (RANOSP)
[1975] 31 p In GERMAN and ENGLISH Sponsored by Deut. Forschungsgemeinschaft
Avail: NTIS HC A03/MF A01

Research activities carried out onboard the Meteor ship are presented. Cs-137 distribution in the whole of the North Sea area was investigated. Both a hydrographical and a geological survey were carried out. ESA

N77-12663# Woods Hole Oceanographic Institution, Mass.
WORKING CONFERENCE ON OCEANOGRAPHIC DATA SYSTEMS
Constantine D. Tollios and Kenneth R. Peal Nov. 1975 360 p refs Conf. held at Woods Hole, Mass., 12-14 Nov. 1975
(AD-A025475) Avail: NTIS HC A16/MF A01 CSCL 08/10

The Working Conference on Oceanographic Data Systems is a forum for the presentation of the state of the art. These papers provide a projection of the future of oceanographic data systems and their role in interfacing the research scientist to the ocean. A great deal of experience has been accumulated and the conferees are now in a position to recommend directions which they, as a community, would like to see taken to standardize and consolidate their efforts so that they can provide better service to the oceanographic community. GRA

N77-12664# Informatics, Inc., Rockville, Md.
BIBLIOGRAPHY OF SOVIET MATERIAL ON INTERNAL WAVES, NO. 6, NOVEMBER 1975 - APRIL 1976
Stuart G. Hibben, L. H. Boylan, and M. Ness 7 May 1976 42 p
(Contract MDA903-76-C-0099; DARPA Order 3097)
(AD-A025813) Avail: NTIS HC A03/MF A01 CSCL 08/3

This is the sixth bibliography of Soviet open-source publications relating to internal wave studies. It covers material received from November 1975 through April 1976. Main selection criteria are studies of small-scale variation in ocean parameters and of airborne techniques for deducing internal wave conditions. An index of serial source abbreviations is appended. Author (GRA)

N77-12665# Texas A&M Univ., College Station. Dept. of Physics.
SUNLIGHT AND THE OCEAN
Gilbert N. Plass and George W. Kattawar 21 Apr. 1976 31 p refs
(Contracts N00014-68-A-0308-0002; N00014-75-C-0537; NR Proj. 083-036)
(AD-A024678; TR-7) Avail: NTIS HC A03/MF A01 CSCL 20/6

The brightness and color of the ocean when seen by natural sunlight is determined by the interaction of the sunlight with the atmosphere, the ocean surface, and the various substances in the ocean. As any substance in any of these regions changes, there are corresponding changes in the reflected and transmitted light which tell a great deal about the state of the ocean and atmosphere. These various factors and their influence on the light distribution in the ocean are reviewed. The results of theoretical calculations are reported which give the distribution of light both above and below the ocean surface for a wide variety of conditions. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N77-12666 Virginia Commonwealth Univ., Richmond.
TOPOLOGY IN BIOLOGY, THE RELATIONSHIP OF STRUCTURE TO FUNCTION Ph.D. Thesis
Wayne Arthur Wiegand 1976 153 p
Avail: Univ. Microfilms Order No. 76-23718

The problem of studying these systems is undertaken with the goal of showing that techniques are now available which allows one to consider complex spacial organization in developing models for the study of the dynamics of biological systems. A specific example of the mitochondrial respiratory cycle in a stirred tank is given and this is contrasted to the situation where the outer membrane introduces the aspect of conponent transport. It is indicated that the complex reaction-diffusion systems one sees in single mitochondria as well as in aggregates of mi-

tochondria are capable of multiple steady states and are also capable of establishing ion gradients as required for filtration in the proximal tubulars. Multiple steady states also allow for a switching process that can turn chemical reaction systems on and off. The techniques presented strongly suggest that many complex processes involving reaction-diffusion systems will exhibit multiple steady states and as such cannot be modeled by previous techniques which do not consider the structure.
Dissert. Abstr.

N77-12667# Armed Forces Radiobiology Research Inst., Bethesda, Md.
MICROWAVE EXPOSURE FACILITY: MULTIPLE ANIMAL EXPOSURE AT EQUAL POWER DENSITY
S. A. Oliva and G. N. Catravas Apr. 1976 24 p refs
(DNA Proj. NWED-QAXMC912)
(AD-A024939; AFRRI-SR76-12) Avail: NTIS HC A02/MF A01 CSCL 14/2

A microwave irradiation facility for multiple animals is described. A feature of the facility is that the natural radiation characteristics of the microwave field are utilized to ensure that each animal in the array receives an equal exposure. Also, the animals are separated sufficiently to ensure minimum interations between animals due to microwave reflections. Cages of sufficient microwave transparency to minimize microwave reflections are incorporated in the facility. Overall, the facility provides equal exposure to all animals to within + or - 15 percent. Author (GRA)

N77-12668# Illinois Univ., Chicago. Dept. of Biological Sciences.
METABOLIC RATES IN FIVE ANIMAL POPULATIONS AFTER LONG-TERM EXPOSURE TO SANGUINE/SEAFARER ELF ELECTROMAGNETIC FIELDS IN NATURE
Bernard Greenberg Apr. 1976 35 p refs
(Contract N00039-73-C-0030)
(AD-A024955) Avail: NTIS HC A03/MF A01 CSCL 06/18

Five species of animals dwelling in or on the soil were collected under the U. S. Navy's Extremely Low Frequency (ELF) antennas at the Wisconsin Test Facility during summer 1975, and tested for oxygen consumption and respiratory quotients (R. Q.). The animals collected include the redbacked salamander, the woodlouse, the slug, the earthworm and the redworm. No significant differences in either oxygen consumption or R. Q. were found. Analyses of metabolic rates employing past data were also performed and showed no seasonally linked change in sensitivity to the electromagnetic fields. Finally, short term (one week) exposure of earthworms to the electromagnetic fields did not alter metabolic rates, but confinement in nylon bags and translocation did, thereby limiting meaningful conclusions.
Author (GRA)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N77-12669 West Virginia Univ., Morgantown.
THE COLLECTION, ANALYSIS, AND COMPARISON OF HUMAN SENSIBLE PERSPIRATION BETWEEN SEDENTARY AND CONDITIONED MALE CAUCASIANS AS TO THE VARIATION IN SELECTED ELECTROLYTE COMPOSITION Ph.D. Thesis
Robert Edward Moore 1976 149 p
Avail: Univ. Microfilms Order No. 76-22439

The specific task was to collect, analyze, and compare human sensible perspiration (eccrine sweat) between sedentary and conditioned male caucasians as to the variation in selected electrolyte concentrations - sodium, chloride, potassium, calcium, and magnesium. It was concluded from the investigation that the sedentary and conditioned groups differed significantly only in the quantity of calcium and magnesium secreted in sweat. These differences showed that the sedentary group secreted the larger quantity of these two electrolytes. Dissert. Abstr.

N77-12670*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 159
Nov. 1976 79 p
(NASA-SP-7011(159)) Avail: NTIS HC $4.00 CSCL 06E

This bibliography lists 257 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1976. Author

N77-12671# Defence Research Board, Ottawa (Ontario). Dept. of Physiology.
DRB AVIATION MEDICAL RESEARCH UNIT REPORTS. VOLUME 5: 1974 - 1976
G. Melvill Jones, comp. and G. Mandl, comp. Sep. 1976 294 p refs
(DRB-DR-225) Avail: NTIS HC A13/MF A01

Reflex movements of the eye are discussed in relation to vestibular contribution to orientation in adverse environments of flight and space. For individual titles, see N77-12672 through N77-12679.

N77-12672# Defence Research Board, Ottawa (Ontario).
NEUROPHYSIOLOGY AND ROAD SAFETY: CONTRIBUTION OF THE FRONTAL LOBES TO VISUAL ORIENTING
D. Guitton and G. Mandl *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 1-9 refs (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01

The functional role of the frontal lobe is described as a major importance in visual orientation. The neural processes and frontal lobe disorders are studied showing their effects on visuo-motor coordination. M.C.F.

N77-12673# Defence Research Board, Ottawa (Ontario).
COLOR INPUTS TO ORIENTATION DETECTORS IN THE HUMAN VISUAL SYSTEM
C. R. Sharpe and G. Mandl *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 69-84 refs (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01

The interaction of spatial and chromatic (red and blue) channels in the human visual system is described. Results from psychophysical experiments have shown that superimposing a low luminance uniform background of one color upon a sinusoidal grating (4c/deg) of another color has no effect upon a subject's contrast threshold for that grating. This lack of contrast dilution was taken to indicate that, at low background luminance, the spatial pattern detectors responsible for detecting the grating were color specific. Cross-color spatial adaptation is orientation specific. The orientation selectivities of same color and cross-color adaptation were compared by the equivalent contrast transformation. When testing red gratings, the tuning curves were broader for cross-color (adapt blue; test red) than for same-color (adapt red; test red) adaptation. The converse was true for testing blue gratings. As the experiments were so arranged that cross-color adaptation could not have been the result of direct test channel excitation, it is suggested that such adaptation may be the after effect of prolonged inhibition between orientation specific spatial pattern detectors. Author

N77-12674# Defence Research Board, Ottawa (Ontario).
THE VESTIBULAR SYSTEM FOR EYE MOVEMENT CONTROL
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 85-101 refs (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01

Inputs to the oculo-motor system are discussed using rotational and linear accelerative stimuli. Eye movements relative to head positions are discussed. M.C.F.

N77-12675# Defence Research Board, Ottawa (Ontario).
PLASTICITY IN THE ADULT VESTIBULO-OCULAR REFLEX ARC
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 102-123 refs (For primary document see N77-12671 03-52)

Avail: NTIS HC A13/MF A01

Human subjects with maintained reversal of their horizontal field of vision exhibit very substantial adaptive changes in their horizontal vestibulo-ocular reflex (VOR). Short durations (8 min) of vision reversal during natural head movement led to 20% VOR attenuation while long periods (4 weeks) eventually led to approximate reversal of the reflex. The reversed condition is approached by a complex, but highly systematic, series of changes in gain and phase of the reflex response relative to normal. Recovery after return to normal vision exhibits a similar duration, but different pattern, to that of the original adaptation. A chronic cat preparation with long-term optical reversal of vision was developed and shows similar adaptive and recovery changes at low test stimulus amplitudes, but different patterns of adaptive response at high amplitudes. An adaptive neural model employing known vestibulo-ocular pathways is proposed to account for these experimentally observed plastic changes. The model is used to predict the adapted response to patterns of stimulation extending beyond the range of experimental investigation.Author

N77-12676# Defence Research Board, Ottawa (Ontario).
AN ADAPTIVE NEURAL MODEL COMPATIBLE WITH PLASTIC CHANGES INDUCED IN THE HUMAN VESTIBULO-OCULAR REFLEX BY PROLONGED OPTICAL REVERSAL OF VISION
P. Davies and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 124-134 refs (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01

A neural model was formulated to answer questions about changes between the vestibular and oculomotor system and whether these changes are responsible for complex gain phase behavior. It is shown that both excitatory and inhibitory influences can impinge simultaneously on cells in the vestibular nuclei projecting to the oculomotor system. M.C.F.

N77-12677# Defence Research Board, Ottawa (Ontario).
THE RESPONSE TO SOUND OF IDENTIFIED RETICULO-SPINAL CELLS
S. Rossignol *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 135-182 refs (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01

The anatomy and physiology of reticulo-spinal (RS) cells were reported together with a comparison of the pattern of response to sound and other stimuli. Identification of RS cells was done by stimulating the ventral surface of the upper lumbar cord and recording extra-cellularly in the brain stem with large stainless steel microelectrodes. Because RS cells respond to sound and due to their role in locomotion, it was concluded that auditory influences on motor control may be mediated through reticulo-spinal pathways. M.C.F.

N77-12678*# Defence Research Board, Ottawa (Ontario).
SUBJECTIVE DETECTION OF VERTICAL ACCELERATION: A VELOCITY DEPENDENT RESPONSE?
G. Melvill Jones and L. R. Young *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 245-255 refs Sponsored by NASA (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01 CSCL 05E

Difficulty in the subjective tracking of the whole body vertical accelerative movement parallel to the long axis of the body is discussed which identified specifically the direction of imposed acceleration to be the difficulty rather than low sensitivity to vertical acceleration. The product of angular acceleration and time to detect proves to be constant over a wide range of suprathreshold step changes of angular acceleration. It is concluded that threshold conditions are determined by the velocity attained rather than the acceleration amplitude for the semicircular canals. M.C.F.

N77-12679# Defence Research Board, Ottawa (Ontario).
HUMAN SUBJECTIVE AND REFLEX RESPONSES TO SINUSOIDAL VERTICAL ACCELERATION
G. Melvill Jones, R. Rolph, and G. H. Downing *In its* DRB Aviation Med. Res. Unit Rept., Vol. 5 Sep. 1976 p 256-270 refs (For primary document see N77-12671 03-52)
Avail: NTIS HC A13/MF A01

Response characteristics are discussed of both subjective sensation and involuntary oculomotor response to a wide range of sinusoidal frequencies of linear acceleration imposed in a vertical direction. Measurements of eye movements were conducted with eyes open behind blackout goggles after at least 45 minutes dark adaptation to ensure minimal changes in electrooculographic gain. The results reveal quite different patterns of subjective and involuntary reflex dependence on the frequency of sinusoidal stimulation. M.C.F.

N77-12680*# Methodist Hospital, Houston, Tex.
AUTOMATED ELECTROENCEPHALOGRAPHY SYSTEM AND ELECTROENCEPHALOGRAPHIC CORRELATES OF SPACE MOTION SICKNESS, PART 2 Final Report
James D. Frost, Jr. 5 Nov. 1976 25 p refs
(Contract NAS9-13870)
(NASA-CR-151106) Avail: NTIS HC A02/MF A01 CSCL 06P

Sleep pattern alterations were detected in two subjects by electroencephalographic, electrographic, and electromyographic monitoring before, during and after a 28 day bed rest. Standardized criteria were used for data analysis. During the second half of the bed-rest period, sleep latency and stage 3 increased, while total sleep time, stage 2, and REM latency decreased. In addition, during bed rest both subjects showed an increase in the number of REM periods and a slight increase in stage REM amount. No major alterations were seen in the recovery period. Of the alterations found to be associated with bed rest, only one, the increase in stage 3 sleep, was also seen consistently during Skylab. Conversely, none of the postflight changes seen following Skylab were observed during the post-bed-rest recovery period. Author

N77-12681# Witwatersrand Univ., Johannesburg (South Africa). School of Mechanical Engineering.
THE BEHAVIOUR OF SKIN TEMPERATURE PROFILES IN THE FOREARM OF A NUDE RESTING SUBJECT AT AIR TEMPERATURES FROM 24 C TO 34 C
A. M. Patterson Jul. 1976 64 p refs
(Rept-69; ISBN-0-85494-396-X) Avail: NTIS HC A04/MF A01

The transient responses of the temperature profiles during a period of four hours after entry into the climatic chamber are presented. The results show that the depth of a surface at which heat is believed to be released within the skin varies systematically with the rate of heat release, and depths of between 0.4 mm and 2.7 mm were observed in this study. A direct, in vivo determination of the thermal conductivity of unperfused skin tissue is also made, and the result 0.1 W/m K obtained. The fact that skin surface heat loss is predominantly accounted for by heat convected to the skin by blood is confirmed. Author

N77-12682# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
REVIEW OF RADIOCHEMICAL METHODS FOR PU-239 DETECTION IN ENVIRONMENTAL AND BIOLOGICAL SAMPLES
S. Greco, F. Notargiacomo, and C. Riccobello 15 Oct. 1975 39 p refs In ITALIAN; ENGLISH summary
(ISS-R-75/12) Avail: NTIS HC A03/MF A01

Radiochemical methods for detection and quantitative analysis of Pu-239 low levels in environmental (soil, water) or biological (urine, human wastes, etc.) samples are described. The methods include the ion exchange chromatography and the solvent extraction. The main physico-chemical properties of Pu-239 and its radiotoxic hazards are reviewed. ESA

N77-12683# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
RADIATION EXPOSURE OF THE ITALIAN POPULATION DUE TO MEDICAL DIAGNOSTIC EXAMINATIONS IN 1974
S. Benassi (CNEN, Rome), F. Dobici (CNEN, Rome), P. L. Indovina (Min. della Sanita), E. Prozzo, L. Pugliani, P. Salvadori, and A. Susanna (CNEN, Rome) 20 Oct. 1975 23 p refs Submitted for publication
(ISS-P-75/13) Avail: NTIS HC A02/MF A01

The genetically significant dose received by the Italian

population due to diagnostic X-ray examination and radiopharmaceuticals was investigated and preliminary results are presented. A rough estimation of dosage gives about 30 mrem, in good agreement with the values obtained from authors in different industrialized countries. These studies are being carried out to reveal eventual abuses of diagnostic radiation sources and to take adequate corrective measures. Author (ESA)

N77-12684# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

HEALTH IMPLICATIONS OF THE RISKS CONNECTED WITH THE USE OF AMERICIUM 241 FOR LIGHTNING PROTECTION

M. Belli, M. Cremonese, and S. Greco 10 Dec. 1975 25 p refs In ITALIAN; ENGLISH summary
(ISS-R-75/16) Avail: NTIS HC A02/MF A01

Americium metabolism is reviewed together with some information on the biological and pathological effects following americium 241 contamination in order to assess the risk due to the use of radioactive isotopes in lightning conductor installations and the resulting implications on public health. Some aspects of radioprotection are presented and it is concluded that the use of americium 241 for lightning protection exposes the population to undue risks. ESA

N77-12685# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

ELECTRON SPIN RESONANCE OF LYOPHILIZED BLOOD SAMPLE

M. Bomba, M. Flamini, P. L. Indovina, and A. Rosati 11 Dec. 1975 20 p refs In ITALIAN; ENGLISH summary
(ISS-P-75/17) Avail: NTIS HC A02/MF A01

Results obtained on lyophilized blood samples (whole blood, red cells, and plasma) from a control group are presented. The measurements show clearly the imperfections; of the lyophilization method in obtaining reproducible results. Consequently, it is without any biological meaning. The electron spin resonance of lyophilized blood, at least in the region of free radicals, is unlikely to be of value as a diagnostic screening test for cancer. Author (ESA)

N77-12686# Illinois Univ., Chicago. Dept. of Materials Engineering.

A MODEL FOR ANALYTIC INVESTIGATION OF THREE-DIMENSIONAL HEAD-SPINE DYNAMICS Final Report, 1 Dec. 1973 - 30 Nov. 1975

T. Belytschko and L. Schwer Wright-Patterson AFB, Ohio AMPL Apr. 1976 212 p refs
(Contract F33615-74-C-4014)
(AD-A025911; AMRL-TR-76-10) Avail: NTIS HC A10/MF A01 CSCL 06/7

A three dimensional, discrete model of the human spine, torso and head was developed for the purpose of evaluating mechanical response in pilot ejection and it was developed in sufficient generality to be applicable to other body response problems, such as occupant response in aircraft crash and arbitrary loads on the head-spine system. There are no restrictions on the distribution or direction of applied loads, so a wide variety of situations can be treated. Results are presented for a variety of conditions, such as different rates on onset, ejection at angles, effects on lumbar curvature, and eccentric head loadings. It is shown that large initial curvatures and perfectly vertical acceleration loadings result in substantial flexural response of the spine, which cause large bending moments. It is further shown that the combination of the spine's low flexural stiffness, initial curvature, and mass eccentricity are such that stability cannot be maintained in a 10 g ejection without restraints or spine-torso-musculature interaction. GRA

N77-12687# Air Force Weapons Lab., Kirtland AFB, N.Mex.

ADJOINT MONTE CARLO GENERATED RADIATION RESPONSE FUNCTIONS FOR THE B-1 AIRCRAFT Final Report

Albert J. Alexander Apr. 1976 54 p refs
(AD-A025756; AFWL-TR-76-6) Avail: NTIS HC A04/MF A01 CSCL 06/18

The adjoint Monte Carlo radiation transport technique is used to calculate radiation response functions for the B-1 aircraft. These radiation response functions are given for the neutron dose and also for the neutron plus the secondary gamma dose. The response functions are given for the head and stomach positions of the left front crew member. They can be folded with any angle and energy dependent neutron and/or gamma ray free field exposure to give the radiation dose. The MORSE multigroup, coupled neutron-gamma ray, Monte Carlo code is used for the adjoint transport in the B-1 aircraft which is modeled with combinatorial geometry. The theory and equations needed to evaluate the coupling integral in terms of the statistical weight of the adjunction on the coupling surface are developed. GRA

N77-12688# Army Aeromedical Research Lab., Fort Rucker, Ala.

AEROMEDICAL REVIEW OF OXYGEN REQUIREMENTS OF US ARMY AVIATORS

Frank S. Pettyjohn and Roderick J. McNeil Apr. 1976 24 p refs
(AD-A024726; USAARL-76-19) Avail: NTIS HC A02/MF A01 CSCL 06/19

Aeromedical review of US Army aircraft oxygen design criteria and military specification indicates physiologic inconsistencies. Oxygen duration charts in use for U-21 aircraft are computed on the basis of military specification using inspiratory minute volume (IMV) of 13.12 liters per minute (LPM), normal temperature (70F), pressure, dry (NTPD). Current oxygen duration charts for the RU-21 aircraft using constant flow regulator have overstated oxygen availability of 62.3% at 10,000 feet and 18.7% at 15,000 feet. Type regulator and dilution schedule are listed for U-21 series aircraft. The current design inspiratory minute volume of 13.12 LPM NTPD is the basic design deficiency. The effects of the activity and stress of flight require an increase of design IMV. GRA

N77-12689# Human Factors Research, Inc., Goleta, Calif.

MOTION SICKNESS INCIDENCE: EXPLORATORY STUDIES OF HABITUATION, PITCH AND ROLL, AND THE REFINEMENT OF A MATHEMATICAL MODEL Technical Report, Oct. 1973 - Apr. 1976

Michael E. McCauley, Jackson W. Royal, C. Dennis Wylie, James F. OHanlon, and Robert R. Mackie Apr. 1976 63 p refs
(Contract N00014-73-C-0040; NR Proj. 105-841)
(AD-A024709; Rept-1733-2) Avail: NTIS HC A04/MF A01 CSCL 06/19

A series of experiments on human subjects assessed the effects of pitch and roll and habituation on motion sickness incidence (MSI). Pitch and roll angular accelerations, even larger than expected at sea, failed to systematically increase MSI. Habituation was evidenced in susceptible subjects who received consecutive daily 1-hour or 2-hour exposures to vertical motion. Habituation was greater for the longer exposure and the more severe motions. A mathematical model describing MSI as a function of the frequency and acceleration of vertical oscillation was refined by including exposure time as an independent variable. Investigation of frequencies of oscillation above .5 Hz confirmed the prediction of the model that MSI continues to decrease as a function of frequency for all frequencies greater than approximately .16 Hz. GRA

N77-12690# Miami Univ., Oxford, Ohio.

EFFECTS OF SOUND ON THE VESTIBULAR SYSTEM Final Report

D. E. Parker, L. A. Ritz, R. L. Tubbs, and D. L. Wood Wright-Patterson AFB, Ohio AMRL Mar. 1976 83 p refs
(Contract F33615-73-C-4002; AF Proj. 7231)
(AD-A025969; AMRL-TR-75-89) Avail: NTIS HC A05/MF A01 CSCL 06/5

Vestibular responses have been evoked from guinea pigs, monkeys, and human beings following stimulation with static pressure, infrasound, sustained audiofrequency sound, and repetitive audiofrequency transients. These observations lead to suggestions concerning the manner in which sound affects the vestibular receptors as well as to proposals concerning levels of sound exposure that might disturb human performance by influencing behaviors mediated at least in part by the vestibular system. Author (GRA)

N77-12691# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS OF ACCELERATION ON SELECTED SERUM ENZYMES Final Report, Mar. - May 1974
Donald R. Sellers, Clarence M. Oloff, Ray D. Brown, and Vittorio Nino Mar. 1976 10 p refs
(AF Proj. 7222)
(AD-A025965; AMRL-TR-75-62) Avail: NTIS HC A02/MF A01 CSCL 06/19

Human volunteers were exposed to 30-second bouts of acceleration at 3, 4, 5, 6, and 7 G at each of three seat back angles on several different experimental days. Blood samples were taken immediately before the experiment and 24 hours later. Samples were analyzed for hematocrit, lactate dehydrogenase, lactate dehydrogenase isoenzyme distribution, creatine phosphokinase, creatine phosphokinase isoenzyme distribution, glutamate oxaloacetate transaminase, and glutamate pyruvate transaminase. None of the assayed biochemical parameters were outside normal clinical limits; however, small but statistically significant increases in creatine phosphokinase in two subjects and increases in lactate dehydrogenase and creatine phosphokinase in the subjects as a group were evident. GRA

N77-12692# EEG Research Inst., Oslo (Norway).
CLEARANCE AND SATURATION OF HYDROGEN GAS IN MAN WITH SPECIAL EMPHASIS ON THE BRAIN
Carl Wilhelm Sem-Jacobsen 1976 63 p refs
(Contract N00014-72-C-0345)
(AD-A025952) Avail: NTIS HC A04/MF A01 CSCL 06/19

Hydrogen gas clearance and saturation in the brain have been monitored in 22 subjects. The half time for hydrogen gas clearance/saturation in the human brain may fluctuate between 1/2 minute and 30 minutes in grey matter and between 6 - 14 minutes in white matter. The half time for hydrogen gas clearance and saturation in the ear-lobes may vary from 1 to 5 minutes, and from 2 to 20 minutes in the skeletal muscles. 8% CO2 added to the breathing air caused a drastic reduction of the half time for saturation/clearance in certain areas in the brain. Changes in respiration produce great fluctuation in the half time for gas clearance and saturation. Changes in blood flow in general or focal to some areas of the body produce drastic changes in the half time for gas clearance and saturation to the involved area. GRA

N77-12693# Joint Publications Research Service, Arlington, Va.
USSR ACADEMY OF MEDICAL SCIENCES
A. M. Chernukh, ed. 2 Dec. 1976 265 p refs Transl. into ENGLISH of the book "Akademiya Meditsinskikh Nauk SSSR" Moscow, Sovetskaya Entsiklopediya, 1976 176 p
(JPRS-68310) Avail: NTIS HC A12/MF A01

A description of the USSR Academy of Medical Sciences, its components and membership is given. Author

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N77-12694# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF CONTINUOUS NOISE ON SHORT TERM MEMORY PERFORMANCE TASKS M.S. Thesis
Iver John Rivenes, III Sep. 1975 33 p refs
(AD-A025446) Avail: NTIS HC A03/MF A01 CSCL 05/10

Naval officers routinely perform a number of tasks requiring short term memory under conditions of moderate background noise levels. The performance of 20 Navy officers on a serial short term memory task was analyzed under two levels of difficulty and two different sound levels. The purpose of the experiment was to determine whether moderate intensity, continuous noise had an effect on short term memory. Analysis of the data collected indicated that continuous noise at a sound level pressure of 85 dB had no effect on the subjects' short term memory. Levels of difficulty resulted in a significant difference in performance on the serial short term memory task used in this experiment. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N77-12695*# Illinois Univ., Urbana. Coordinated Science Lab.
PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Semiannual Progress Report, May - Oct. 1976
William B. Rouse, Yee-Yeen Chu, Joel S. Greenstein, and Rex S. Walden Oct. 1976 50 p refs
(Grant NSG-2119)
Avail: NTIS HC A03/MF A01 CSCL 05E

An investigation was made of interaction between a human pilot and automated on-board decision making systems. Research was initiated on the topic of pilot problem solving in automated and semi-automated flight management systems and attempts were made to develop a model of human decision making in a multi-task situation. A study was made of allocation of responsibility between human and computer, and discussed were various pilot performance parameters with varying degrees of automation. Optimal allocation of responsibility between human and computer was considered and some theoretical results found in the literature were presented. The pilot as a problem solver was discussed. Finally the design of displays, controls, procedures, and computer aids for problem solving tasks in automated and semi-automated systems was considered. L.S.

N77-12696# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECTIVENESS OF FOUR WATER COOLED UNDERGARMENTS AND A WATER COOLED CAP IN REDUCING HEAT STRESS
George F. Fonseca Dec. 1975 30 p refs
(AD-A025216; USARIEM-T-23/76) Avail: NTIS HC A03/MF A01 CSCL 06/17

The cooling provided by four different water cooled undergarments was directly measured on a heated copper manikin dressed in a basic hot-weather flight coverall, aircrew helmet, socks and black boots. This cooling, which represents absorption of the heat produced by the metabolic processes of the body plus that from the ambient environment in the cabin, was found to be almost directly proportional to the difference between the manikin skin temperature and the temperature of the cooling water at the inlet to a water cooled undergarment. Isolation of the manikin surface from the hot environments was provided by only a water cooled undergarment and the basic hot-weather clothing ensemble. Although these cooling garments did not, by themselves, completely isolate the manikin surface against heat gain from the hot environment, they did remove about one-half of the potential for heat gain from the ambient environment before the heat reached the manikin surface. The water cooled cap, which covered just the head (or only about 6% of the total body surface area) removed about 1/3 of the total metabolis heat production of a seated person. GRA

N77-12697# Webb Associates, Yellow Springs, Ohio.
SAMPLING AND DATA GATHERING STRATEGIES FOR FUTURE USAF ANTHROPOMETRY Final Report
Edmund Churchill Feb. 1976 43 p refs
(Contract F33615-73-C-4066; AF Proj. 7184)
(AD-A025240; AMRL-TR-74-102) Avail: NTIS HC A03/MF A01 CSCL 06/5

Beginning with a comprehensive review of anthropometric resources already available, this report serves as a guide to more refined and less costly methods of acquiring needed anthropometric data to meet changing military requirements and to accommodate changing military populations. Many sampling schemes are described and evaluated for their utility in meeting specific USAF needs. Various measurement and sampling errors are discussed

and the effects of each type of error on the statistics of major importance in design problems are explained. A multi-faceted plan for the future acquisition of USAF anthropometric data is recommended. GRA

N77-12698# Army Materiel Command, Texarkana, Tex. Intern Training Center.

A FREE HEAD-MOVEMENT PUPILLOMETER SYSTEM Final Report

Alfred William Stillman, Jr. Aug. 1975 70 p refs

(AD-A025900; USAMC-ITC-02-08-75-114) Avail: NTIS HC A04/MF A01 CSCL 06/2

The report describes a realizable free head-movement solid-state pupillometer system using a 100-by-100 element charge-coupled device as the means of recording the diameter of the pupil of the eye. In this description are discussed basic concepts of pupillometers, charge-coupled devices, and the application to pupillometry of one specific charge-coupled device with supporting solid-state circuitry. Integrated into this report are considerations of safety, human factors, and system maintenance. GRA

N77-12699# Webb Associates, Yellow Springs, Ohio.

STATISTICAL CONCEPTS IN DESIGN

John T. McConville and Edmund Churchill May 1976 57 p refs

(Contract F33615-75-C-5003; AF Proj. 7184)

(AD-A025750; AMRL-TR-76-29) Avail: NTIS HC A04/MF A01 CSCL 06/14

In seeking a manageable way to deal with variations for a large range of body sizes, it is a common practice for designers to construct drafting board manikins, three-dimensional forms or computer simulations as human analogues. Often these analogues are based upon 5th, 50th, or 95th percentile values. Limitations of this approach are discussed in this paper which demonstrate fallacies underlying the assumptions that (1) the proportionality of various individuals is the same and (2) percentiles for body dimensions are additive. Focusing on the 5th and 95th percentile body forms where deviations in size and proportionality are most severe, the report recommends an improved approach to portray the body size of these segments of the population in design problems. A statistical analysis is made of the tails of the height-weight distribution to demonstrate the usefulness of subgroups or regression values. GRA

N77-12700# Naval Postgraduate School, Monterey, Calif.

INVESTIGATION AND EVALUATION OF A ZERO INPUT TRACKING ANALYZER (ZITA) M.S. Thesis

Ronald Edward James Mar. 1976 48 p refs

(AD-A025431) Avail: NTIS HC A03/MF A01 CSCL 05/10

This study was designed to evaluate a psychomotor testing instrument known as the ZITA (Zero Input Tracking Analyzer). This instrument was being considered as a prediction device in the selection of applicants for the U. S. Navy aircrew training program. Analysis of the data obtained from six subjects (all U. S. Navy pilots) over 26 hours of testing, showed the machine capable of consistent results in distinguishing between subjects with respect to this particular psychomotor task. A major disadvantage of the ZITA that became apparent was the amount of time (approximately 2 hours) required before learning curves were leveled out and the rate at which different individuals develop their learning curve. Author (GRA)

N77-12701# Naval Postgraduate School, Monterey, Calif.

AN ANALYSIS OF THE EFFECT OF A FLIGHT DIRECTOR ON PILOT PERFORMANCE IN A HELICOPTER HOVERING TASK M.S. Thesis

Timothy William Duffy Mar. 1976 54 p refs

(AD-A025680) Avail: NTIS HC A04/MF A01 CSCL 01/4

A fixed-base simulator evaluation of a flight director for maintaining longitudinal control of a helicopter in the hover mode of operation was made. Test subjects performed ninety-second precision hovering tasks utilizing two cockpit displays. The second display differed from the first only by the addition of the flight director indicator. The helicopter and each display were simulated on a hybrid computer. The hovering task consisted of minimizing root mean square longitudinal and vertical deviation from an initial equilibrium position. Root mean square performance data and numerical pilot opinion ratings were obtained. These data indicated significant improvement in performance when the flight director was being utilized. Author (GRA)

N77-12702# Michigan Univ., Ann Arbor. Highway Safety Research Inst.

A PREDICTION OF RESPONSE OF THE HEAD AND NECK OF US ADULT MILITARY POPULATION TO DYNAMIC IMPACT ACCELERATION FROM SELECTED DYNAMIC TEST SUBJECTS Annual Report, Apr. 1975 - Apr. 1976

L. W. Schneider, B. M. Bowman, R. G. Snyder, and L. S. Peck May 1976 164 p refs

(Contract N00014-75-C-1077; NR Proj. 105-832)

(AD-A025785; UM-HSRI-76-10; ATR-1) Avail: NTIS HC A08/MF A01 CSCL 06/19

Physical characteristics of the head and neck were measured on 18 male Navy volunteers who had previously undergone testing on the NAMRL sled facility at Michoud Station, New Orleans. Measurements include 55 standard anthropometric measures, 32 anthropometric measures of the seated subject, three dimensional head and neck range of motion, neck muscle reflex times in response to head jerks, and neck muscle voluntary isometric strength. These latter measurements were taken in both the sagittal and lateral planes. Measurement results were used to establish parameter values for the MVMA-2D Crash Victim Simulator data set in an attempt to reproduce the dynamic response of these volunteers to -Gx sled acceleration at 6 and 15 G's. Procedures used for computing the various parameter values and comparisons between predicted and experimental results are presented. In addition, measurement data for 18-24 year females taken previously have been utilized to predict the dynamic response that would be expected if these subjects were tested at 6 and 15 G's. GRA

N77-12703# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

TEST PLOT EVALUATION OF A RECLINED COCKPIT SEAT AS AN AID TO G TOLERANCE AND PERFORMANCE Final Report, Sep. 1973 - Mar. 1975

John W. Frazier and Kenneth W. McElreath Jan. 1976 24 p refs

(AF Proj. 7222)

(AD-A025784; AMRL-TR-75-73) Avail: NTIS HC A02/MF A01 CSCL 06/17

Twenty-two student test pilots have participated in closed-loop tracking indoctrination runs on the Dynamic Environment Simulator. Each pilot flew through a series of profiles up to 6 G in both the conventional upright seat position and a 55 deg tilt back seat position. The subjective responses and pilot questionnaires are presented. GRA

N77-12704# Naval Aerospace Medical Research Lab., Pensacola, Fla.

DEVELOPMENT OF A PROTOTYPE EXPERIMENTAL PLAN TO EVALUATE STABILIZED OPTICAL VIEWING DEVICES. 2: INFLIGHT MEASURES OF AIRSICKNESS POTENTIAL

W. Carroll Hixson, Fred E. Guedry, Jr., Joel W. Norman, David D. Glick, and Roger W. Wiley 8 Mar. 1976 27 p refs Sponsored in part by Army

(AD-A025455; NAMRL-1223; USAARL-76-15) Avail: NTIS HC A03/MF A01 CSCL 05/8

Investigators at the Naval Aerospace Medical Research Laboratory and the U. S. Army Aeromedical Research Laboratory conducted a combined field and laboratory study to evaluate observer performance while using an improved XM-76 stabilized viewing device. Air-to-ground observations were made in a UH-1 aircraft, flying maneuvers modeled in part after a scout helicopter scenario. The experimental protocol was such that visual acuity data were collected under three different observation conditions: with the naked eye, with XM-76 operated in its normal stabilized mode, and with the XM-76 operated in a caged or nonstabilized mode. Measures of selected airsickness symptoms were derived from an onboard flight observer and from postflight questionnaires. The resulting data indicate that the level of airsickness symptoms manifested by the subject group while using the device was higher than the baseline level present when the observations were made without the device. In contradistinction to the hypothesis that the stabilization feature

of such devices increases the airsickness potential, the general trend of the data showed the opposite effect. GRA

N77-12705# Quest Research Corp., McLean, Va.
FEASIBILITY OF IMPLEMENTING SPECIFIC PERFORMANCE MEASUREMENT TECHNIQUES Final Report
Diane G. Loental Wright-Patterson AFB, Ohio AMRL Mar. 1976 110 p refs
(Contract F33615-73-C-4121)
(AD-A025945; AMRL-TR-74-95) Avail: NTIS HC A06/MF A01 CSCL 05/9

The report presents two techniques for performance measurement in a manned weapon system. The particular system studied was the F-106 coplanar attack simulator located at the Systems Effectiveness Branch, Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio. The first technique involves a theoretical model of the human operator's flight control policies on the simulator. The second technique is empirical and derives performance measures from the simulator data. Author (GRA)

N77-12706# Federal Highway Administration, Washington, D.C. Traffic Systems Div.
THE EFFECT OF AUDITORY AND VISUAL PRESENTATION OF NAVIGATIONAL MESSAGES ON MESSAGE RETENTION Final Report
Frank P. Gatling Jun. 1976 27 p refs
(PB-256599/2; FHWA-RD-76-94) Avail: NTIS HC A03/MF A01 CSCL 05J

Navigational messages containing from two to seven units of information were presented to three groups of subjects. One group of subjects received the messages after they had seen an alerting sign and, in response to the sign, turned the radio to a specified frequency to receive the message (manual group). A second group received the messages automatically and aurally (automatic group). The third group received the information visually. Performance of the three groups is compared. Gra

N77-12707# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
NOTES ON THE COMPUTATION OF THE GENERALIZED ZETA AND DIGAMMA FUNCTIONS WITH PROGRAMS AND TABLES
W. H. Mason and B. E. Nerney Oct. 1974 38 p refs
(Contract N00014-72-A-0136-0001; NR Proj. 061-197)
(AD-A025134; VPI-Aero-023) Avail: NTIS HC A03/MF A01 CSCL 12/1

Function subprograms for the computation of the digamma function and generalized zeta function are presented. Some new analytic results are given, and tables of 20 place values of the functions are provided in order to check the computer codes. The digamma function is tabulated for $x = 0.5(0.5)10$, and the generalized zeta function is given for $s = 2(1)42$, $a = 0.05(.05)1(.1)2(.5)10(1)21$. Author (GRA)

N77-12708# Advisory Group for Aerospace Research and Development, Paris (France).
VISUAL AIDS AND EYE PROTECTION FOR THE AVIATOR
Thomas J. Tredici (School of Aerospace Medicine, Brooks AFB, Tex.) Oct. 1976 89 p Presented at the Aerospace Med. Panel Specialist Meeting, Copenhagen, 5-9 Apr. 1976
(AGARD-CP-191; ISBN-92-835-0177-2) Avail: NTIS HC A05/MF A01

Information concerning visual aids and eye protective devices used by the aviator is discussed. Among the topics considered were: protection from retinal burns and flash blindness due to atomic flash; vision with the AN/PVS-5 night vision goggle; in-flight evaluation of optically stabilized target acquisition devices; and the correction of presbyopia. For individual titles, see N77-12709 through N77-12717.

N77-12709# Royal Aircraft Establishment, Farnborough (England). Neurosciences Div.
EYE PROTECTION, PROTECTIVE DEVICES AND VISUAL AIDS
D. H. Brennan *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 12 (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

The major ocular hazards encountered in military aviation are discussed and some protective measures which may be adopted are described. The hazards considered are solar glare, bird strike, wind blast, miniature detonating cord, lasers and nuclear flash. The role of image intensifiers in aviation is also discussed. Author

N77-12710# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
INTEGRATION OF AVIATORS EYE PROTECTION AND VISUAL AIDS
Gloria T. Chisum and Phyllis E. Morway *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 7 (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

Recent technological developments have resulted in additional functions being assigned to the helmet and visor. The additional functions range from static aids for distant vision to dynamic displays of information for use in weapon control and guidance, and aircraft management and situational information. Basic requirements for the protective equipment were established. The expanded functions for the protective equipment require that modifications be made in the equipment configuration. The modifications must be accomplished without sacrificing the basic functions of protection. Accomplishment of these two goals requires cooperation between the display designers and crew equipment specialists. Author

N77-12711# Sandia Labs., Kirtland AFB, N. Mex.
PROTECTION FROM RETINAL BURNS AND FLASHBLINDNESS DUE TO ATOMIC FLASH
Billy J. Pfofp (ASD/SMLS Life Support SPO, Wright-Patterson, AFB, Ohio), J. Thomas Cutchen, and J. O. Harris *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 6 refs (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

Transparent ferroelectric ceramic material, lead lanthanum zirconate titanate (PLZT), has enabled the development of large aperture electrooptic shutters in goggle or window type formats which provide sufficiently rapid decrease in transmitted light intensity to prevent flashblindness and permanent retinal burn from ultraviolet, visible and infrared radiation encountered in nuclear explosions. Author

N77-12712# Air Force Systems Command, Brooks AFB, Tex.
USAF AVIATOR CLASSES, HGU-4/P: HISTORY AND PRESENT STATE OF DEVELOPMENT
Thomas J. Tredici *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 6 refs (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

The aviator goggle HGU-4F has the important fundamental role of enhancing and protecting the vision of U.S. Air Force aviators. The spectrum of presently available lenses is reviewed. Studies to improve the product are detailed, in particular, the impact tests, both drop ball and ballistic, of glass (heat treated and chemical ion exchange) and plastic (CR-39 and polycarbonate). The practical tests of plastic versus glass lenses used in the field is reviewed. The culmination of this research has resulted in the presently available product, one that is felt to be the best that the state-of-the-art can presently produce. Author

N77-12713# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
CONCERNING FLIGHT AND THE CORRECTION OF PRESBYOPIA [A PROPOS DU VOL ET DE LA CORRECTION DES PRESBYTES]
J. P. Chevaleraud and Ch. Corbe *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 4 refs In FRENCH (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

The use of eyeglasses by civil and military pilots over the age of 40 is investigated. The need for special lenses for flight use is discussed. A method is presented for determining the corrective measures needed for subjects with diminished power of accommodation for near objects. A.H.

N77-12714# Service de Sante pour l'Armee de l'Air, Paris (France).
FLIGHT FITNESS AND PLIANT CONTACT LENSES [APTITUDE AU VOL ET LENTILLES DE CONTACT SOUPLES]
J. P. Chevaleraud and G. Perdriel *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 4 refs In FRENCH (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

Four subjects were tested in a pressurized tank to determine the physiological effects of flexible contact lenses having 40% absorbency. Corneal sensitivity, ocular tone, and the permeability of lachrymal ducts were observed. Lachrymal secretion and binocular vision were measured. The advantages of soft contact lenses over hard lenses is discussed. A.H.

N77-12715# Army Aeromedical Research Lab., Fort Rucker, Ala.
VISION WITH THE AN/PVS-5 NIGHT VISION GOGGLE
Roger W. Wiley and Frank F. Holly *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 12 refs (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

Results are presented from a series of experiments in which visual performance using the AN/PVS-5 night vision goggle was measured. Visual modulation transfer functions of the man-goggle system were determined and compared to results obtained with unaided viewing. The man-goggle system performance was superior to unaided visual performance at average target luminances equivalent to 5% and 25% moon illuminances. A+, a target luminance equilvalent to a full moon illuminance, unaided visual performance was superior at higher spatial frequencies, while remaining poorer at the lower spatial frequencies. Using a modified Howard-Dolman apparatus, it was determined that the stereoscopic threshold was degraded with the man-goggle system. Field measurements of relative depth discrimination using all available visual cues showed that performance of the man-goggle system was statistically equivalent to unaided phototopic visual performance at intermediate viewing distances, but was inferior to unaided viewing at distances of 500 feet or greater. Author

N77-12716# Centre de Recherches du Service de Sante des Armees, Clamart (France).
EXPERIMENTAL STUDY OF VISION DIMMING IN AN ANIMAL [ETUDE EXPERIMENTALE DE L'EBLOUISSEMENT CHEZ L'ANIMAL]
L. Court, J. P. Chevaleraud, G. Perdriel, and M. Basin *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 11 refs In FRENCH (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

Vision dimming is a temporary deficit in visual perception in a subject submitted to intense luminous energy, at a level higher than that of his level of adaptation. Electrodes were implanted in a monkey and a rabbit to study the electrophysiological rectification and behavior caused by glare. The time of recuperation is measured. Transl. by A.H.

N77-12717# Army Aeromedical Research Lab., Fort Rucker, Ala.
IN-FLIGHT EVALUATION OF HAND-HELD OPTICALLY STABILIZED TARGET ACQUISITION DEVICES
David D. Glick *In* AGARD Visual Aids and Eye Protection for the Aviator Oct. 1976 p 13 (For primary document see N77-12708 03-54)
Avail: NTIS HC A05/MF A01

Several target acquisition devices are compared in-flight. Considering size, weight, complexity, and performance in an in-flight visual acuity task, one of the devices looked promising. A group of twenty-nine subjects used a single device in a scout helicopter flight scenario. The device produced motion sickness and the experimental plan was designed to assess this as well as visual acuity in flight. The subjects flew the scenario first with the unaided eye and then with the device in both a stabilized and unstabilized (caged) mode. The latter two flights were counterbalanced across subjects. Following the flight phase, the subjects were given a series of tests to evaluate individual susceptibility to motion sickness. Performance in the visual acuity task was significantly correlated with the airsickness rating of an on-board experimenter; however, there was no significant difference between the magnitude of the symptoms observed when the device was stabilized and the magnitude when caged. Author

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N77-12718*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ON THE HABITABILITY OF MARS: AN APPROACH TO PLANETARY ECOSYNTHESIS
M. M. Averner, ed. and R. D. MacElroy, ed. Washington 1976 114 p refs
(NASA-SP-414) Avail: NTIS HC A06/MF A01 CSCL 06F

The possibility of utilizing Mars as a habitat for terrestrial life, including man, is examined. Available data, assumptions, and speculations on the climate, physical state, and chemical inventory of Mars are reviewed and compared with the known requirements and environmental limits of terrestrial life. No fundamental, insuperable limitation of the ability of Mars to support a terrestrial ecology is identified. The lack of an oxygen-containing atmosphere would prevent the unaided habitation of Mars by man. The present strong ultraviolet surface irradiation is an additional major barrier. The creation of an adequate oxygen and ozone-containing atmosphere on Mars may be feasible through the use of photosynthetic organisms. The time needed to generate such an atmosphere, however, might be several millions of years. This period might be drastically reduced by the synthesis of novel, Mars-adapted, oxygen producing photosynthetic strains by techniques of genetic engineering, and modifying the present Martian climate by melting of the Martian polar caps and concomitant advective and greenhouse heating effects. Author

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N77-12719 Clarkson Coll. of Technology, Potsdam, N.Y.
OPTIMAL SCHEDULING OF TASKS ON MULTIPROCESSOR SYSTEMS Ph.D. Thesis
Robert Marcel Mattheyses 1976 54 p
Avail: Univ. Microfilms Order No. 76-22490

Two problems related to the scheduling of a set of dependent activities on a multiprocessor system are discussed. The first problem concerns the scheduling of activities on a system of identical processors. An algorithm is presented which produces optimal schedules in the sense of minimum execution time. The algorithm is shown to produce valid results even when the execution times for the individual activities are not required to be identical. The second problem concerns the derivation of bounds on the execution time for the optimal schedule when the processors are not identical. The concept of a bounding system is presented. It is shown that if S is a bounding system for S'

then the execution time of the optimal schedule for a set of activities on S forms a bound on the execution time of the optimal schedule for the same set of activities on S'.
Dissert. Abstr.

N77-12720 Johns Hopkins Univ., Baltimore, Md.
COMPUTER-PRODUCED FACES AS AN ICONIC DISPLAY FOR COMPLEX DATA Ph.D. Thesis
Robert Joseph Kassel Jacob 1976 203 p
Avail: Univ. Microfilms Order No. 76-22926

The use of computer-generated cartoon faces is investigated. They are claimed to have desirable features for such displays, particularly integrality of their many dimensions. The present investigation reveals that, for some useful tasks, these faces do consitute a superior representation for multidimensional Euclidean data, both in an experimental setting and in a practical application. Additionally, it was found that the stereotype meaning already present in faces can be exploited to advantage in the represetation of psychological data. Dissert. Abstr.

N77-12721* National Aeronautics and Space Administration. Pasadena Office, Calif.
COMPUTER INTERFACE SYSTEM Patent
Tage O. Anderson, inventor (to NASA) (JPL) Issued 26 Oct. 1976 10 p Filed 5 Aug. 1974 Supersedes N74-30549 (12 - 20, p 2388) Sponsored by NASA
(NASA-Case-NPO-13428-1; NASA-Case-NPO-13447-1; US-Patent-3,988,716; US-Patent-Appl-SN-495022; US-Patent-Class-340-172.5; US-Patent-Class-179-15BA; US-Patent-Class-328-111) Avail: US Patent Office CSCL 09B

An interface logic circuit permitting the transfer of information between two computers having asynchronous clocks is disclosed. The information transfer involves utilization of control signals (including request, return-response, ready) to generate properly timed data strobe signals. Noise problems are avoided because each control signal, upon receipt, is verified by at least two clock pulses at the receiving computer. If control signals are verified, a data strobe pulse is generated to accomplish a data transfer. Once initiated, the data strobe signal is properly completed independently of signal disturbances in the control signal initiating the data strobe signal. Completion of the data strobe signal is announced by automatic turn-off of a return-response control signal. Author

N77-12722# California Univ., Livermore. Lawrence Livermore Lab.
FENIX: THE LRLTRAN COMPILER FOR THE STAR
R. G. Zwakenberg 27 Jan. 1976 12 p refs
(Contract W-7405-eng-48)
(UCID-30128) Avail: NTIS HC A02/MF A01

The FENIX complier, available on the CDC 7600 and STAR-100 computers, is intended to replace the STAR compiler now on the 7600. FENIX accepts the full LRLTRAN language, but has a few differences from the STAR compiler that make it more compatible with standard Fortran. The major differences are the requirement that all macro and compile-time statements must be processed through the PRECOMP marco processor; and that blanks have no meaning except in Hollerith and label fields. Author (ERA)

N77-12723# Florence Univ. (Italy). Ist. d'Elettronica.
A VISUAL DISPLAY SYSTEM FOR THE HP 2100A COMPUTER [SISTEMA DI PRESENTAZIONE VIDEO PER L'ELABORATORE HP 2100A]
Franco Pirri 1976 21 p refs In ITALIAN
(R-1-76) Avail: NTIS HC A02/MF A01

A video unit to be connected to a HP 2100A computer for graphics work is presented. The system makes use of an A/D/A converter. The working principles are described. The application software is detailed. ESA

N77-12724# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fiscia.
GRAPHIC DISPLAY UNIT FOR THE IBM 7040 COMPUTER OF THE HIGHER INSTITUTE OF HEALTH
M. Gricia (Ist. Nazl. di Fis. Nucl.), M. S. Alikhan, and A. Verdecchia 20 Jan. 1975 27 p refs In ITALIAN; ENGLISH summary
(ISS-T-75/2) Avail: NTIS HC A03/MF A01

The logic and technical details regarding the connection of a Tektronix 611 storage display unit to an IBM 7040 computer of the Physics Laboratories are described. The display unit is used as an alternate high speed graphic output device to a much slower plotter already included in the system. A package of subroutines for simple use of this unit has been developed and is available at the Computer Center's library. Author (ESA)

N77-12725# Illinois Univ., Urbana. Coordinated Science Lab.
THE DESIGN OF TOTALLY SELF-CHECKING SYSTEMS Ph.D. Thesis
David Su-Ming Ho Apr. 1976 111 p refs
(Contract DAAB07-72-C-0259)
(AD-A025608; R-723) Avail: NTIS HC A06/MF A01 CSCL 09/2

A totally self-checking system is a digital system consisting of functional units and hardware checkers interconnected so that faults are detected and indicated as soon as they affect system operation. The functional units employ encoded information which is continually checked by hardware checkers. The selection of information encoding, the design of functional units, and the design of checkers are interrelated; each unit must be designed in such a way that, for any of the modeled faults, a non-code output is produced for at least one code input and at the same time an incorrect code output is never produced for a code input. The primary advantage of a totally self-checking design over conventional designs is that it will not produce an erroneous output without an indication. A general purpose minicomputer is redesigned to be totally self-checking. This redesign involves the selection of fault modes and corresponding encodings for each of the functional units, the design of functional units, the design of a microprogrammed totally self-checking control sequencer, and the architectural arrangement of functional units and checkers to achieve a totally self-checking system.
Author (GRA)

N77-12726# Illinois Univ., Urbana. Coordinated Science Lab.
MAXIMAL CLOCKING RATES FOR PIPELINED DIGITAL SYSTEMS M.S. Thesis
Bradly Kevin Fawcett Dec. 1975 69 p refs
(Contract DAAB07-72-C-0259; Grant NSF GJ-40584)
(AD-A025611; R-706; UILU-ENG-75-2242) Avail: NTIS HC A04/MF A01 CSCL 09/2

Constraints are derived for controlling the clock inputs to the storage registers of a synchronously controlled pipelined digital system. Limits on the clock width, clock period, and clock skew between segments of the pipeline are described in terms of the propagation delay times of the logic elements of the network. Separate constraints are developed for pipelines using three different types of register elements: Earle latches, D-latches, and edge-triggered flip-flops. A 2-segment, 16-bit pipelined adder is used to test the timing constraints, including an analysis of the propagation delays of the logic elements in the sample network.
Author (GRA)

N77-12727# Rome Air Development Center, Griffiss AFB, N.Y.
MASK PATTERN GENERATION TECHNIQUES
Jerald M. Plante Apr. 1976 178 p refs
(AF Proj. 1955)
(AD-A025343; RADC-TR-76-31) Avail: NTIS HC A09/MF A01 CSCL 09/2

The theory advanced through this research project provides basic techniques which can be used for optimizing the generation of periodic monotonic mask patterns. The techniques set forth should be particularly useful in computational problems which require very large length mask patterns for processing, especially when using parallel or associative processing computers. The research extends current results for generating mask patterns of length 2 to the m power to consider the general case of n to the m case of n to the m power length mask patterns. Basically, the techniques developed involve the use of a minimum set of predefined (basic) periodic and monotonic patterns in conjunction with the logical operations 'and' and 'or'. An algorithm is developed which generates basic patterns for any value of n, where n to the m power is the length of the mask patterns to be generated. Several theorems are developed which allow the determination of the most efficient mask pattern generation

technique. This is accomplished through the computation of the number of logical operations required to generate mask patterns using the various techniques which are discussed in the report. Author (GRA)

N77-12728# Harry Diamond Labs., Adelphi, Md.
PRINTER VERSION OF PLOTS MADE BY AN INCREMENTAL PLOTTER
Egon Marx Dec. 1975 27 p
(DA Proj. 1W1-62118-AH-75)
(AD-A025898; HDL-TM-75-33) Avail: NTIS HC A03/MF A01 CSCL 09/2

A software package to produce printer plots is presented. The principal purpose of this coding is the approximation of the plots produced by the programs DRAW1 and DRAW4 on an incremental plotter, with considerable savings in the time needed to receive the output. To receive the plots on the printer, only the names of the subroutines have to be changed to DRAW2 and DRAW3, respectively. GRA

N77-12729# Computer Sciences Corp., Falls Church, Va.
EXPERIMENTAL TEST CONCEPT FOR A CARGO DATA INTERCHANGE SYSTEM (CARDIS). VOLUME 1: TEXT Final Report, May 1975 - Apr. 1976
C. Ruthling, W. Penrose, and M. Wall May 1976 60 p
(Contract DOT-TSC-1026-1)
(PB-256822/8; DOT-TSC-OST-76-25-1-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 17B

The recommended CARDIS experimental test system functional capabilitites are explored. The CARDIS functions that are inherent to an information exchange capability and optional systems which are required by the transportation related industries are identified. The criteria to evaluate the various system functions selected for implementation by test participants are included as are the CARDIS test objectives. GRA

N77-12730# Computer Sciences Corp., Falls Church, Va.
EXPERIMENTAL TEST CONCEPT FOR A CARGO DATA INTERCHANGE SYSTEM (CARDIS). VOLUME 2: APPENDIXES Final Report, May 1975 - Apr. 1976
C. Ruthling, W. Penrose, and M. Wall May 1976 147 p
(Contract DOT-TSC-1026-2)
(PB-256823/6; DOT-TSC-OST-76-25-2-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 17B

For Abstract see N77-12729.

N77-12731# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
PDP-11 MACRO CROSS ASSEMBLER
Robert P. Rich May 1976 86 p refs
(Contract N00017-72-C-4401)
(AD-A025751; APL/JHU-BCO-76-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

A cross assembler has been written to run off-line on the IBM 360-370 computer to assemble programs for the PDP-11/20 computer to be link-edited by the latter. The macro capabilities of vendor-supplied assemblers have been somewhat extended. The present version provides input for the DOS Linker-Loader, but output formatting is done by a separate program module, so that the work of matching to other link-editors is minimized. Author (GRA)

N77-12732# Missouri Univ., Columbia. Information Science Group.
DISEASE INFORMATION SYSTEM Final Report, Jun. 1974 - Jun. 1975
Donald A. B. Lindberg and Samuel J. Dwyer, III Oct. 1975 19 p
(Contract DAMD17-74-C-4122)
(AD-A025477; MOU-IS-PR-9) Avail: NTIS HC A02/MF A01 CSCL 06/5

This document is intended to constitute a summary of work accomplished for Contract No. DAMD 17-74-C-4122, 'Disease Information System'. Author (GRA)

N77-12733# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF INTERACTIVE GRAPHICS DISPLAY IN A MULTIPROGRAMMING ENVIRONMENT M.S. Thesis
Lloyd Allen Thorpe Mar. 1976 28 p refs
(AD-A025681) Avail: NTIS HC A03/MF A01 CSCL 09/2

This thesis is a summary of the design and implementation of an operating system interface and a user interface for an interactive graphics display system. The actual interface software and documentation are characteristic of the Naval Postgraduate School environment. Documents describing the actual software and user interface are published separately. The general problems and solutions involved in implementing a real-time interactive graphics process in a multiprogramming environment are included herein. The problems and solutions discussed are related to the interface of a Vector General Graphics Display Unit and a Digital Equipment Corporation PDP-11/50 computer. Recommendations for possible future developments are also included. Author (GRA)

N77-12734# Williams Coll., Williamstown, Mass.
COMPARISON OF COMPUTER SIMULATION MODELS WITH FIELD DATA FROM NEARSHORE ENVIRONMENTS Final Report, Jan. 1969 - Apr. 1976
William T. Fox and Richard A. Davis, Jr. (Univ. of South Fla.) 1 Apr. 1976 62 p refs
(Contract N00014-69-C-0151; NR Proj. 388-092)
(AD-A025682; TR-15) Avail: NTIS HC A04/MF A01 CSCL 08/6

Computer simulation models of coastal processes provide an accurate means of predicting wave and current conditions in the nearshore environment. A 7-year study was undertaken to develop and test a series of computer simulation models based on time-series data from field studies. The field studies include Stevensville, Mich. Sheboygan, Wis. Mustang Island, Texas Cedar Island, Va. South Beach, Ore. Zion, Ill., South Haven, Mich. and Plum Island, Mass. A series of computer programs was developed for analysis and plotting of the field data. A Fourier analysis program was used to plot smoothed curves for weather, waves and current variables. Topographic maps and maps of erosion and deposition were plotted based on daily beach and nearshore profiles. An 'Area-time Prism' model was formulated to graphically portray changes in beach and nearshore bar configuration through time. A 'Coastal Process Simulation Model' was developed to predict wave and longshore current conditions, and beach and bar erosion on the eastern shore of Lake Michigan. A 'Coastal Storm Model' based on the size, shape and intensity of a coastal storm predicts wind, waves and currents for any coastal orientation. The coastal storm model can hindcast conditions of past storms or produce short term forecast in developing storms. The model is based on an inverted normal curve which is rotated around the center of a storm system. GRA

N77-12735# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
AN APPROACH TO GLOBAL REGISTER ALLOCATION Ph.D. Thesis. Interim Report
Richard Karl Johnsson Dec. 1975 141 p refs
(Contract F44620-73-C-0074; ARPA Order 2466)
(AD-A024966; AFOSR-76-0603TR) Avail: NTIS HC A07/MF A01 CSCL 09/2

The thesis presents an approach to the problem of global register allocation as performed by an optimizing compiler. The problem considered is actually the more general one of choosing what physical resource within the target machine will be used to hold the results of various computations in a running program. The results may be the values of common Redundant Subexpressions, partial results developed during expression evaluation, or variables declared by the programmer. An optimizing compiler can make better use of the resources of the target machine if these decisions are all considered together at or near the source level rather than being distributed throughout the compiler and operating at both source and object levels. A decomposition of an optimizing compiler is presented with research focusing on one part of the compiler, namely the part wich assigns the computed results to physical locations. GRA

N77-12736# Army Construction Engineering Research Lab., Champaign, Ill.
DEVELOPMENT OF THE MILITARY CONSTRUCTION DATA SYSTEM (MCDS), PART 2
Willima H. Stellhorn, Kin-Man Chung, and William Wong Apr.

1976 46 p refs
(DA Proj. 4A7-62719-AT-01)
(AD-A024938; CERL-IR-P-66-Pt-2) Avail: NTIS HC A03/MF A01 CSCL 05/2

Three major activities in the on-going development of the Military Construction Data System are described. A revised structure for the data dictionary/directory is presented and the function of its various components explained. An experiment is described in which the contents of two data files maintained under the SYSTEM 2000 data base management software are transferred to a RAMIS insulation. Finally a test interface between the MCDS data base and an independent application program is discussed. Recommendations fo near-term development include the maintenance of selected 'live' data files and provision of retrieval services for users. Author (GRA)

N77-12737# Auerbach Associates, Inc., Philadelphia, Pa.
DISK DRIVE INTERFACE CHARACTERISTICS Final Report
9 Apr. 1976 105 p refs
(Contract NBS-5-35924)
(PB-256440/9; AAI-2332-FR; NBS-GCR-76-63) Avail: NTIS HC A06/MF A01 CSCL 09B

The various characteristics of the interface between computer disk drives and disk controllers are compared for those drives using removable disk packs having a storage capacity of approximately 100 million bytes or greater. Disk pack interchangeability, drive performance characteristics, interface functional characteristics, and interface electrical characteristics are described. A conclusion is reached that although nearly all of the drives reviewed use the same type of disk pack, that at the circuit and electrical level substantial differences of a detailed engineering nature exist in the interfaces. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N77-12738 Polytechnic Inst. of New York.
ENCODING REDUCTION AND CLASSIFICATION OF TWO-DIMENSIONAL DATA BY FACTOR ANALYSIS TECHNIQUES Ph.D. Thesis
Chun Sup Yoon 1976 120 p
Avail: Univ. Microfilms Order No. 76-23457

A pattern classification is a series of processes consisting of a digitizing, data reduction and classification process. A new series of those processes is considered. As a digitizing process, level-crossing encoding scheme is introduced and compared with the chain code method. Factor analysis is used as a data reduction scheme, and a modified factor loading matrix suggests a simple way of partitioning. This series of processes is applied to several problems of classifying waveforms and line drawings. When pictorial data is available in a gray-value-matrix form, pictures can be classified by the same data reduction and classification methods. The results suggest that factor analysis techniques in association with appropriate precoding and/or preprocessing procedures yield a flexible framework for an efficient approach to classification of two-dimensional data.
Dissert. Abstr.

N77-12739 Illinois Inst. of Tech., Chicago.
MODIFICATION OF THE PENALTY FUNCTION ALGORITHM TO REDUCE COMPUTATIONAL EFFORT Ph.D. Thesis
Kenneth Lee Slepicka 1976 113 p
Avail: Univ. Microfilms Order No. 76-23502

The selection of the method for solving the series of unconstrained problems generated by the penalty function algorithm was studied. Constraint equations were used in the weighting factor reducing scheme. The possibility of adjusting the values of the initial weighting factors as a way to reduce computational effort was investigated. A method using the initial feasible solution and constraint equations to adjust the initial weighting factors was shown to have the potential for improving the algorithm. The effect of the convergence criteria in the penalty function algorithm was investigated. The accuracy of the solutions to the series of unconstrained penalty functions appeared to play a role in the efficiency of penalty function algorithm. A variable convergence criterion was devised for the series of penalty function to be solved which only required an accurate solution when near the constrained problem optimum. Dissert. Abstr.

N77-12740 Vanderbilt Univ., Nashville, Tenn.
FORESTER: A LANGUAGE FOR MORPHOLOGICAL ANALYSIS OF HIERARCHICAL SYSTEMS, WITH REFERENCE TO STRUCTURAL EXEGESIS OF THE SYNOPTIC TRADITIONS Ph.D. Thesis
Judson Floyd Parker 1976 136 p
Avail: Univ. Microfilms Order No. 76-22360

A means is developed to utilize computers effectively in the structural exegesis of the synoptic traditions of the New Testament. Such exegesis represents the structure of a given text as a tree like hierarchy. These trees can be quite large, and it is necessary to create, display, modify, and--in particular--compare morphologically the trees for all of the texts in the synoptic traditions. Consequently, the language FORESTER was designed and implemented to meet these needs. Substantial effort went into the human engineering of the language so as to make it as convenient and natural as possible. Intrinsic to FORESTER is the ability to manipulate tree structured data and to gather together trees whose structures are similar. In addition, the implementation is as independent of any specific computer system as was practical. The result is a language which has been well received by those New Testament researchers for whom it was developed.
Dissert. Abstr.

N77-12741 George Washington Univ., Washington, D.C.
ON-LINE VIRTUAL ARCHITECTURE TUNING USING MICROCAPTURE Ph.D. Thesis
Laird Hamilton Moffett 1976 192 p
Avail: Univ. Microfilms Order No. 76-21765

The improvement of a program execution via automatic on-line tuning of the virtual architecture of a microprogrammed computer system is described. Microcapture Tuning is presented as a method of performing automatic tuning of loops during program execution. Various concepts of microprogramming that are pertinent to the understanding of the tuning concept are summarized. Background information on earlier tuning techniques is presented. The Heuristic Synthesis tuning procedure is presented since it forms the bases for the Microcapture Tuning concept. The Microcapture Tuning algorithm is divided into three basic phases: the trace phase, the synthesis phase, and the execution phase. The trace phase is performed by the Microcapture Tuning hardware to provide the specific statistics to enable the automatic tuning to occur. Once the proper statistical data is obtained, the synthesis phase is initiated. Dissert. Abstr.

N77-12742 Princeton Univ., N.J.
EFFICIENT ALGORITHMS FOR CHORDAL GRAPHS AND INTERVAL GRAPHS Ph.D. Thesis
George Schick Lueker 1975 196 p
Avail: Univ. Microfilms Order No. 76-22603

Algorithms to recognize chordal graphs and interval graphs in linear time are presented. The problem of determining isomorphism for chordal graphs is shown to be as hard as arbitrary graph isomorphism (in the sense of polynomial reducibility); interval graph isomorphism, on the other hand, is shown to be decidable in linear time. The algorithms are primarily based on two concepts. The first is a modified form of breadth first search, called lexicographic breadth first search; this search method eliminates some of the arbitrary choices made during a conventional breadth first search, thereby producing a vertex ordering which gives more information about the structure of the graph. A second concept used in the thesis is a PQ-tree. This is a structure which enables one to concisely represent and manipulate certain sets of permutations. Dissert. Abstr.

N77-12743 Princeton Univ., N.J.
MONOTONE DATA FLOW ANALYSIS FRAMEWORKS: A FORMAL THEORY OF GLOBAL COMPUTER PROGRAM OPTIMIZATION Ph.D. Thesis
John Ban Nang Kam 1976 158 p
Avail: Univ. Microfilms Order No. 76-22636

Global data flow analysis problems (abreviated as gdfap's) are represented by a monotone data flow analysis framework D=(L, landa, F), where the semilattice L is attached to each of its elements, giving the elements a meaning, normally a data which could reach statement in a program. With each basic block of the program a function f is associated in F. f is a function from L to L, which intuitively represents how data is transformed when control passes through the basic block. The issues involved in computing the meet over all paths solution are investigated, when a program to be optimized according to a particular gdfap is given. The meet over all paths solution can be interpreted informally as the calculation for each statement in the program of the maximum information, relevant to the gdfap, which can be derived from every possible execution path from the starting point of the progam to that particular statement. Dissert. Abstr.

N77-12744 Massachusetts Univ., Amherst.
THE USE OF CONTEXT IN CHARACTER RECOGNITION Ph.D. Thesis
Edward George Fisher 1976 186 p
Avail: Univ. Microfilms Order No. 76-22259

Improvements to binary n-gram algorithms are proposed which facilitate the use of different types of n-grams for a collection of words of varying lengths. Algorithms which utilize this extended data base for the detection, location, and correction of insertion, deletion, split, and merger errors are presented. A primary feature of the new algorithms is that the n-grams are anchored to one or both ends of the word. Experiments are performed which show that the algorithms are effective for all of the error types. For example, in a dictionary of 10,000 words, without a priori knowledge of the types of errors being processed, the contextual postprocessor was able to correct 81 percent of single substitution errors, 57.7 percent of deletions, and 63.2 percent of double substitution errors. Numerous experiments were performed to examine the performance of the postprocessing algorithms as a function of dictionary size, as a function of word length, and as a function of the size of the contextual data base. Dissert. Abstr.

N77-12745 Syracuse Univ., N.Y.
MASK PATTERN GENERATION TECHNIQUES Ph.D. Thesis
Jerald Mason Plante 1975 177 p
Avail: Univ. Microfilms Order No. 76-18553

The techniques developed involve the use of a minimum set of predefined (basic) periodic and monotonic patterns in conjunction with the logical operations and and or. An algorithm is developed which generates basic patterns for any value of n, where n to the power of m is the length of the mask patterns to be generated. Several theorems are developed which allow the determination of the most efficient mask pattern generation technique. This is accompolished through the computation of the number of logical operations required to generate mask patterns using the various techniques which are discussed in the paper. Dissert. Abstr.

N77-12746# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
USING STRONG CONVERGENCE TO ACCELERATE VALUE ITERATION
Thomas E. Morton Mar. 1976 14 p refs
(AD-A025604; RR-390; WP-64-75-76) Avail: NTIS HC A02/MF A01 CSCL 12/2

Convergence of the relative value function (total value function less total value of a base state) and the optimal policy in length of the horizon for value iteration (Markov decision programming) have been recently shown to be geometric with factor alpha beta. Here alpha is the discount factor, and beta < or equal to 1.0. The case beta < 1.0 is termed 'strong convergence'. It is suggested in this paper that bounds on the convergence rate be estimated computationally during the value iteration process, giving bounds directly on the extrapolated infinite horizon relative value function. Such an extrapolation has two purposes. First, large numbers of iterations in value iteration can be skipped by continuing computation directly with the estimated infinite horizon relative value function (this is directly analogous to quadratic acceleration procedures in non-linear programming). Second, existing procedures for the elimination of non-optimal actions are greatly strengthened, since actions can be eliminated permanently once bounds on the infinite horizon relative value function become sufficiently tight. GRA

N77-12747# Illinois Univ., Urbana. Coordinated Science Lab.
ON FINDING K NEAREST NEIGHBORS IN THE PLANE M.S. Thesis
Der-Tsai Lee May 1976 69 p refs
(Contract DAAB07-72-C-0259)
(AD-A025610; R-728; UILU-ENG-76-2216) Avail: NTIS HC A04/MF A01 CSCL 12/1

The nearest neighbor problem arises in several applications such as density estimation, pattern classification and information retrieval. The problem is to find, among a set of points (or feature vectors), the one which is most similar or closest to a given test point according to some dissimilarity or distance measure. One straightforward way of solving it is to compute the 'distances' between each point of the set and the test point and then search for the point P with minimum distance. The k-nearest neighbor problem to be considered here is a variant of the classical nearest neighbor problem. GRA

N77-12748# Wisconsin Univ., Milwaukee. Dept. of Electrical Engineering.
SPACE-TIME TRADE-OFFS IN STRUCTURED PROGRAMMING Interim Report
R. A. DeMillo, S. C. Eisenstat (Yale Univ., New Haven, Conn.), and R. J. Lipton (Yale Univ., New Haven, Conn.) Jan. 1976 8 p refs
(Grant DAHC04-74-G-0179)
(AD-A025599; TR-CS-76-5; ARO-12142.3-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

The report extends the results of a previous paper by improving the space-time inequality by an exponential, and includes reducible flowgraphs. GRA

N77-12749# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.
SOFTWARE MODELING STUDIES Interim Technical Report, 1 Jul. - 31 Dec. 1975
Martin L. Shooman and Henry Ruston May 1976 71 p refs
(Contract F30602-74-C-0294)
(AD-A025895; POLY-EE/EP-76-003; POLY-SMART-101; RADC-TR-76-143) Avail: NTIS HC A04/MF A01 CSCL 09/2

During the period of time of 1 Jul. 75 to 31 Dec. 75, Polytechnic Institute of New York conducted research in the area of software reliability. This report presents the progress of this research. Subjects of investigation were prediction models for the number of errors in computer software, theoretical models for software testing, automatic programming, measures for the evaluation of software, probabilistic models of program testing, and estimation of the initial number of program errors. GRA

N77-12750# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
REASONING FROM INCOMPLETE KNOWLEDGE IN A PROCEDURAL DEDUCTION SYSTEM M.S. Thesis
Robert Carter Moore Dec. 1975 120 p refs Revised.
(Contract N00014-75-C-0643)
(AD-A024971; AI-TR-347) Avail: NTIS HC A07/MF A01 CSCL 09/2

Procedural deduction languages, such as PLANNER, have been valuable tools for building models involving the notion of an explicit model of a problem situation. This report explores methods of increasing the ability of procedural deduction systems to deal with incomplete knowledge. The report examines in detail, problems involving negation, implication, disjunction, quantification, and equality. Control structure issues and the problem of modeling change under incomplete knowledge are also considered. GRA

N77-12751# Naval Research Lab., Washington, D.C.
POSITION-FIXING AND POSITION-PREDICTING PROGRAMS FOR THE HEWLETT-PACKARD MODEL 9830A PROGRAMMABLE CALCULATOR Final Report
Kingsley P. Thompson and Joseph H. Kullback Apr. 1976 90 p refs

(AD-A024972; NRL-MR-3265) Avail: NTIS HC A05/MF A01 CSCL 17/7

There have been significant advances in calculators in recent years. One model, the Hewlett-Packard 9830 A, has a hardwired BASIC interpreter, a memory size of 7904 16-bit words, a capability of serving as a terminal, and a number of useful peripherals. This material provides some documentation on two 9830 programs written at the Naval Research, Laboratory. These programs deal with (a) the determination of a ship's position from certain combinations of range and/or bearings from given stations and (b) the smoothed track histories of maneuvering targets and the prediction of future positions based on these tracks. The programs are illustrative of the complexity of programs that can be performed in the HP 9830 A without memory overlays. The documentation includes some explanatory examples, equation development and complete program listings. GRA

N77-12752# University of Southern Calif., Marina del Rey. Information Sciences Inst.

XED USERS MANUAL. BEGINNING INSTRUCTION

May 1976 25 p

(Contract DAHC15-72-C-0308; ARPA Order 2223)

(AD-A025738; ISI/TM-76-3) Avail: NTIS HC A02/MF A01 CSCL 09/2

This manual is an introduction to the use of the editing program XED on the TENEX computer system. It is written primarily for the first time user. The manual describes the general operation of XED and a basic set of commands to do productive work. The document assumes a familiarity with basic capabilities of TENEX and how to use them. Reference is also made to a generally available TENEX program called SNDMSG which allows users to produce and deliver messages to other TENEX or ARPANET user directories. Author (GRA)

N77-12753# Defense Communications Engineering Center, Reston, Va.

SOL-370 LANGUAGE REFERENCE MANUAL AND USERS' GUIDE

Horst Ulfers Dec. 1975 43 p refs

(AD-A025927; TN-25-75) Avail: NTIS HC A03/MF A01 CSCL 09/2

SOL-370 is a simulation system for discrete (message-by-message) modeling. It has been implemented on the IBM 370 system, but will also run on the IBM 360 system. This technical note describes the syntax of the SOL language in context with discrete simulation models. Author (GRA)

N77-12754# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

A SURVEY OF PARALLEL ALGORITHMS IN NUMERICAL LINEAR ALGEBRA Interim Report

Don Heller Feb. 1976 84 p refs

(Contracts N00014-76-C-0370; Grant NSF MCS-75-222-55; NR Proj. 044-422)

(AD-A024792) Avail: NTIS HC A05/MF A01 CSCL 09/2

The existence of parallel and pipeline computers has inspired a new approach to algorithmic analysis. Classical numerical methods are generally unable to exploit multiple processors and powerful vector-oriented hardware. Efficient parallel algorithms can be created by reformulating familiar algorithms or by discovering new ones, and the results are often surprising. A comprehensive survey of parallel techniques for problems in linear algebra is given. Specific topics include: relevant computer models and their consequences, evaluation of ubiquitous arithmetic expressions, solution of linear systems of equations, and computation of eigenvalues. GRA

N77-12755# Aerospace Corp., El Segundo, Calif. Information Processing Div.

THE GENERALIZED TRAJECTORY SIMULATION SYSTEM. VOLUME 4: NUMERICAL OPERATORS Final Report, 1 Jan. 1975 - 1 Jan. 1976

J. L. Searcy 15 Apr. 1976 106 p refs

(Contract F04701-75-C-0076)

(AD-A025436; TR-0076(6666)-1-Vol-4; SAMSO-TR-75-255-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 16/2

The Generalized Trajectory Simulation (GTS) system provides a vehicle design and trajectory simulation capability. GTS is written in FORTRAN and is compatible with CDC 6000/7000 series computer systems. User-oriented input data specifications, computational efficiency, diverse program applicability, and convenient program modifications have been primary considerations in the design of the GTS system. The trajectory simulation capability can accommodate diverse types of vehicle configurations, flight profiles, and mission objectives. Additionally, the GTS system contains an extensive vehicle sizing capability and a state-of-the-art optimization capability. This volume documents the GTS library of optimization, integration, and interpolation operators. Included with the description of each operator is a description of the input data required to execute the operators and recommendations concerning the types of problems for which each operator is best suited. Author (GRA)

N77-12756# Naval Underwater Systems Center, Newport, R.I.

SPECTRAL ANALYSIS OF A UNIVARIATE PROCESS WITH BAD DATA POINTS, VIA MAXIMUM ENTROPY AND LINEAR PREDICTIVE TECHNIQUES

Albert H. Nuttall 26 Mar. 1976 129 p refs

(AD-A024942; NUSC-TR-5303) Avail: NTIS HC A07/MF A01 CSCL 12/1

A comparison of several methods for spectral estimation of a univariate process with equi-spaced samples, including maximum entropy, linear predictive, and autoregressive techniques, is made. The comparison is conducted via simulation for situations both with and without bad (or missing) data points. The case of bad data points required extensions of existing techniques in the literature and is documented fully here in the form of processing equations and FORTRAN programs. It is concluded that the maximum entropy (Burg) technique is as good as any of the methods considered, for the univariate case. The methods considered are particularly advantageous for short data segments. This report also reviews several available techniques for spectral analysis under different states of knowledge and presents the interrelationships of the various approaches in a consistent notation. Hopefully, this non-rigorous presentation will clarify this method of spectral analysis for readers who are nonexpert in the field. Author (GRA)

N77-12757# Litton Systems, Inc., San Carlos, Calif. Electron Tube Div.

DEVELOPMENT OF COMPUTER PROGRAM TWTVA FOR CALCULATION OF 3-D ELECTRON TRAJECTORIES IN COUPLED-CAVITY TWTS Final Report, 10 Nov. 1975 - 10 Mar. 1976

J. R. M. Vaughan 10 Mar. 1976 119 p refs

(Contract N00123-76-C-0424)

(AD-A025132; L-59333-2) Avail: NTIS HC A06/MF A01 CSCL 09/1

The report describes the development of a computer program for calculation of three-dimensional electron trajectories in a coupled cavity traveling wave tube. RF, magnetic and space charge fields are included without paraxial approximations. Both PPM and solenoid magnetic fields are admitted. Each field is represented by a potential matrix. The RF vector potential matrix is computed from an integration of Kosmahl and Branch's field formulation. The magnetic vector potential matrix is derived from ideal current loops representing the field sources. The space charge potential matrix is obtained by an extension of Hockney and Buneman's Fourier Analysis Cyclic Reduction method to cylindrical coordinates. The trajectory steps are then computed from analytic integrals of the general cross-field equations of motion, using a fast subroutine for simultaneous interpolation and differentiation of the potential matrices. A comprehensive example is given of output obtained from the program. GRA

N77-12758# Geological Survey, Denver, Colo.

PROGRAMMER'S GUIDE FOR REMAPP REMOTE SENSING ARRAY PROCESSING PROCEDURES Final Report

Timothy E. Townsend and Don L. Sawatzky Jun. 1976 46 p

(PB-256693/3; USGS-GD-76-012) Avail: NTIS HC A03/MF A01 CSCL 09B

Subroutines which provide general input, output, and other services to REMAPP applications programs are considered. REMAPP is a set of applications programs and utility subroutines designed to facilitate the processing of remotely sensed image

data. REMAPP is currently implemented on a DECsystem-10. GRA

N77-12759# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
COMPUTER PROGRAMS FOR MULTIDIMENSIONAL SPECTRA ARRAY PROCESSING
Jessie M. Young and Wayne A. Hoyle Aug. 1975 151 p refs
(PB-256098/5; NOAA-TR-ERL-345; WPL-43; NOAA-76030301) Avail: NTIS HC A08/MF A01 CSCL 09B

A number of FORTRAN routines are combined to phase-steer and process outputs from a planar array of sensors. The intent has been to make maximum use of the Fourier transform, and FFT (Fast Fourier Transform) algorithms in particular, in order to shorten computation of correlations, convolutions, and spectra. The array is treated as a linear instrument, the transfer function (or array response) is computed, and the array response is convolved with the input signal to obtain the array output. Output is presented as printout and/or microfilm plots. GRA

N77-12760# Geological Survey, Denver, Colo.
OPTRIN AND OPTAPE: PROGRAMS FOR INTERCHANGE OF DATA BETWEEN REMAPP AND THE OPTRONICS P-1700 SYSTEM Final Report
Don L. Sawatzky and Timothy E. Townsend Jun. 1976 43 p
(PB-256692/5; USGS-GD-76-013) Avail: NTIS HC A03/MF A01 CSCL 09B

Documentation for users of programs OPTRIN and OPTAPE are provided. These programs perform data interchange between REMAPP, image-data processing programs implemented on a DECsystem-10 computer, and the OPTRONICS P-1700 microdensitometer. Program OPTRIN reads OPTRONICS format tape files into REMAPP format disk files, and program OPTAPE writes OPTRONICS format tape files from REMAPP format disk files. GRA

N77-12761# Data Use and Access Labs., Arlington, Va.
CENTS-AID II PROGRAMMER'S NOTEBOOK
Feb. 1976 15 p
(Contract PHS-72-2707)
(PB-256475/5; NTIS/DF-76/003a) Avail: NTIS HC A02/MF A01 CSCL 05K

Technical information concerning the installation, operation, and maintenance of the CENTS-AID II software is provided. The notebook contains a schematic diagram and brief narrative description of the primary functions of each of the eleven programs which comprise the system. It also describes several optional program modifications that can be implemented at installation time which will custom-tailor the system to local user needs. The notebook is designed to be a repository of technical information. GRA

N77-12762# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
AN APPROACH OF DEVELOPING FAST TRANSFORM ALGORITHMS Interim Report
Sun-maw Yang and Tse-yun Feng Griffiss AFB, N. Y. RADC Mar. 1976 134 p refs
(Contract F30602-74-C-0335; AF Proj. 5581)
(AD-A024665; RADC-TR-76-92) Avail: NTIS HC A07/MF A01 CSCL 12/1

To summarize for each chapter, Chapter 2 gives a method to describe fast transform algorithm and illustrate it by applying it for two classes of input for FFT. Chapter 3 derives a new definition of Walsh functions and illustrates its usefulness by applying it for Walsh transform, and Walsh summing and differencing transforms. Several potential applications are also pointed out. Chapter 4 presents a generalized FWT algorithm which is obtained from previous results in this study together with the result of presently existing FWT algorithms. GRA

N77-12763# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION AND COMPARISON OF THREE NONLINEAR PROGRAMMING CODES M.S. Thesis
Ralph John Waterman Mar. 1976 95 p refs
(AD-A024930) Avail: NTIS HC A05/MF A01 CSCL 12/2

This study evaluates and compares the production use of three nonlinear programming codes. The three codes and their developers are: SUMT by W. C. Mylander, R. L. Holmes and G. P. McCormick, GRG by L. S. Lasdon, A. D. Waren, M. W. Ratner and A. Jain, and GRAVES by G. W. Graves. This is the first computer comparison of these three particular codes. Each code was evaluated with respect to the time and sophistication required of the user and the degree of mandatory or potential interaction between the code and the analyst. The comparison criteria were accuracy, robustness, efficiency and ease of utilization. Eight current and realistic test problems employing from 9-100 variables and 2-20 constraints were used. The results revealed that no single code was superior or inferior in all aspects. The choice of an optimal code among these three would be dependent upon the problems to be solved, the ability of the analyst and the desire of the analyst to alter the code for his own purposes. Author (GRA)

N77-12764# Naval Postgraduate School, Monterey, Calif.
THE SINGULAR SURFACE IN THE PARAMETER SPACE; APPLICATIONS M.S. Thesis
Paul Franklin Vantassel Dec. 1975 87 p refs
(AD-A024909) Avail: NTIS HC A05/MF A01 CSCL 09/2

The basic theory of the parameter plane and the singular line is reviewed. Previously unknown properties of the singular line and its relationship to the parameter plane are introduced. The singular surface, a hypersurface of singular values in the parameter plane, is introduced. Compensation techniques using the singular line are demonstrated and a computer program for determining the existence of singular lines is presented. GRA

N77-12765# Hughes Research Labs., Malibu, Calif.
MULTIDITHER ADAPTIVE ALGORITHMS Interim Report, 1 Aug. - 31 Oct. 1975
James E. Pearson, K. M. Brown, R. G. Finucane, M. L. Minden, and K. D. Price Griffiss AFB, N. Y. RADC Apr. 1976 44 p refs
(Contract F30602-76-C-0022; ARPA Order 1279; AF Proj. 1279)
(AD-A025185; RADC-TR-76-56) Avail: NTIS HC A03/MF A01 CSCL 20/6

Reduction of thermal blooming distortions has been studied as a function of the initial transmitter irradiance profile. The data, obtained by computer simulation of focused-beam propagation, indicate that the best way to increase the peak target irradiance is to make the aperture distribution as uniform as possible. This conclusion holds for Gaussian, truncated or apodized Gaussian, annular or circular beams, and for special 'hole-in-the-middle' laser modes. Two computer simulations have been developed. One code calculates thermal blooming correction with a full-servo simulation of a multidither COAT system. The second code models a multidither Zernike-polynomial COAT system (ZEP-COAT) with up to 13 polynomials. This code can be used with or without a simulation of a 37-element deformable mirror. Identical performance is obtained for linear propagation with the ZEP-COAT code and with a conventional multidither, outgoing-wave COAT (MOW-COAT) simulation code. A 37-element deformable mirror has been designed for use with the DARPA/RADC 18-channel, visible-wavelength multidither COAT system. The design and performance goals of this uncooled mirror are summarized. Author (GRA)

N77-12766# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DISTRIBUTED COMPUTATION AND TENEX-RELATED ACTIVITIES Quarterly Progress Report, 1 Feb. - 30 Apr. 1976
R. Schantz and R. Thomas Jun. 1976 18 p
(Contract N00014-75-C-0773; ARPA Order 2901)
(AD-A025956; BBN-3315; QPR-6) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report describes BBN efforts in the design of the National Software Works system and BBN efforts to integrate TENEX into the National Software Works system. Author (GRA)

62 COMPUTER SYSTEMS

Includes computer networks.

N77-12767*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOW-COST DATA ANALYSIS SYSTEMS FOR PROCESSING MULTISPECTRAL SCANNER DATA
Sidney L. Whitely Washington Oct. 1976 41 p refs Original contains color illustrations
(NASA-TR-R-467; JSC-S-460; JSC-10949) Avail: NTIS HC A03/MF A01 CSCL 08B

The basic hardware and software requirements are described for four low cost analysis systems for computer generated land use maps. The data analysis systems consist of an image display system, a small digital computer, and an output recording device. Software is described together with some of the display and recording devices, and typical costs are cited. Computer requirements are given, and two approaches are described for converting black-white film and electrostatic printer output to inexpensive color output products. Examples of output products are shown. Author

N77-12768# Florence Univ. (Italy). Ist. d'Elettronica.
CHILD: A SYSTEM FOR THE DEVELOPMENT AND DIDACTIC INTRODUCTION TO MICROPROCESSORS [CHILD: UN SISTEMA PER LO SVILUPPO E LA DIDATTICA DEI MICROPROCESSORI]
Franco Pirri and Gianni Becattini 1976 15 p refs In ITALIAN
(R-4-76) Avail: NTIS HC A02/MF A01

The advantages of microprocessors to industrial product development are outlined. The elements and structure of a development modular system based on the Fairchild F8 microprocessor are detailed. Applications to student training are described. ESA

N77-12769# Politecnico di Torino (Italy). Ist. di Elettronica e Telecomunicazioni.
SIMULATION SOFTWARE OF DIGITAL DATA DETECTION METHODS. PART 1: THEORETICAL ANALYSIS. PART 2: COMPUTER PROGRAMS Final Report
S. Benedetto, E. Biglieri, V. Castellani, L. LoPresti, and M. Pent Mar. 1976 198 p refs
(Contract ESTEC-2328/74-HP)
(THA/320/RWO/JS-Pt-1/2; ESA-CR(P)-842-Pt-1/2) Avail: NTIS HC A07/MF A01

Software was developed for determining the performance of coherent and differentially coherent demodulation of M-phase PSK (phase shift keying) signals with various degrading factors. Models of the coherent and the differentially coherent PSK cases are presented under the following assumptions: samples of the signal at the output of the channel are stored in an array obtained through numerical methods by the user, the noise is Gaussian, the nonlinear device is a bandpass device, etc. For the DCPSK demodulator it is assumed that the delay of the delay line is equal to the signaling period. A description is given of the computer programs written. ESA

N77-12770# Florida Univ., Gainesville. Dept. of Industrial and Systems Engineering.
DISTANCE CONSTRAINTS FOR TREE NETWORK MULTI-FACILITY LOCATION PROBLEMS
Richard L. Francis, Timothy J. Lowe, and H. Donald Ratliff Feb. 1976 46 p refs
(Contract DAHC04-75-G-0150; Grant NSF ENG-75-102; DA Proj. 200-61102-A-14D)
(AD-A025287; RR-76-2; ARO-12640.3-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of finding locations of new facilities in an imbedded tree network with respect to existing facilities, with upper bounds imposed on distances between all pairs of facilities was considered. The separation conditions are related to shortest paths through an associated network which has as arc lengths the upper bounds on pairwise facility distances. Also an algorithm was given which constructs a feasible solution to the distance constraints if one exists. As an application the separation conditions were solved for a multifacility minimax location problem. Further, the results of this paper should be useful in addressing nonlinear minimax location problems, and multiobjective, multifacility location problems. GRA

N77-12771# California Univ., Los Angeles. School of Engineering and Applied Science.
COMPUTER NETWORK RESEARCH Semiannual Technical Report, 1 Jul. - 31 Dec. 1975
Leonard Kleinrock, Gerald Estrin, Michel Melkanoff, Richard R. Muntz, and Gerald Ropek 31 Dec. 1975 258 p refs
(Contract DAHC15-73-C-0368)
(AD-A025914) Avail: NTIS HC A12/MF A01 CSCL 09/2

The basic model under consideration is a closed network representing N terminal users competing for the use of a set of processing resources. With the assumption that all users are statistically identical, asymptotic expressions are derived for performance measures such as resource utilization and mean response time when N is large. These expressions characterize the behavior of the system as N increases. They have the important advantages that (1) they are simple functions of the model parameters, and (2) they apply to models that do not yield to exact analysis. For the basic model, formal definitions are also given to terms like limiting resource, system saturation, and system balance. A limited memory model is then used to study the effect of memory limitations on the asymptotic properties of resource utilization and mean response time. GRA

N77-12772# IBM Federal Systems Div., Huntsville, Ala.
DATA BUS NETWORK SIMULATION Interim Report, 31 Mar. - 11 Aug. 1975
L. Balliet, James W. Dalton, James R. Earl, and William W. Scott Mar. 1976 79 p refs
(Contract F33615-75-C-1133; AF Proj. 2052)
(AD-A025115; IBM-76W-0026; AFAL-TR-75-209) Avail: NTIS HC A05/MF A01 CSCL 17/2

The report describes a FORTRAN coded digital computer simulator program for predicting waveforms on a data bus network consisting of a main bus with numerous stubs connected via transformer couplers. Bus operation is at baseband with configurations compatible with MIL-STD-1553. The report includes simulation theory, program operation, operating instructions and laboratory verification data. GRA

N77-12773# National Bureau of Standards, Washington, D.C.
A REVIEW OF NETWORK ACCESS TECHNIQUES WITH A CASE STUDY: THE NETWORK ACCESS MACHINE Interim Report
Robert Rosenthal Jul. 1976 42 p refs
(Grant NSF DCR-72-01206)
(PB-256525/7; NBS-TN-917) Avail: NTIS HC A03/MF A01 CSCL 09B

The techniques used in network access devices are identified. By examining these devices, the trend toward improving the interface between the user and the computer is brought more clearly into focus and up to date. One specific solution-A Network Access Machine (NAM)-is described in detail. The NAM is a minicomputer system that acts as a network access point for a user at this terminal and assists the user through the automatic execution of access procedures. This minicomputer facility allows the user to specify (or to have specified) his own network command sequences for execution on a specified network and host connected to that network. GRA

N77-12774# USC/Information Sciences Inst., Marina del Rey, Calif.
DISTRIBUTED COMPUTATION STUDY Final Technical Report, May - Nov. 1975
Stephen R. Kimbleton and Richard L. Mandell Griffiss AFB, N. Y. RADC Apr. 1976 199 p refs
(Contract F30602-75-C-0222; AF Proj. 5550)
(AD-A024670; RADC-TR-76-108) Avail: NTIS HC A09/MF A01 CSCL 09/2

Efficient access and utilization of a collection of computer systems interconnected by a communications network requires development of a Network Operating System (NOS). By definition, an NOS, in analogy with a host operating system, is intended to provide ease of user access to the collection of resources comprising the network and to support allocation of resources among multiple competing requests. This report summarizes the results of a study directed toward: identification of NOS objectives, determination of constraints implicit in achieving these objec-

tives, description of an approach for NOS development.
Author (GRA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N77-12775# Florence Univ. (Italy). Facolta d'Ingegneria.
CHARACTERISTIC EXPONENTS AND LINEAR CONTROL PROBLEMS [ESPONENTI CARATTERISTICI E PROBLEMI DI CONTROLLO LINEARE]
Luciano Pandolfi 1975 13 p refs In ITALIAN Presented at the Seminary of the Ist. di Mat. Appl., Florence, 27 May 1975
Avail: NTIS HC A02/MF A01

The properties of characteristic exponents are described, and new exponents are introduced. The relation to the characteristic exponents are given, and various theorems are demonstrated. An application to linear control is given. ESA

N77-12776# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Informatique Industrielle.
DATA PROCESSING AND INDUSTRIAL PROCESS CONTROL. PART 3: NUMERICAL CONTROL (LEVEL 2 FUNCTIONS) AND ECONOMIC OPTIMIZATION (LEVEL 3 FUNCTIONS) [INFORMATIQUE ET CONDUITE DE PROCEDES INDUSTRIELS. III. REGULATION NUMERIQUE (FONCTIONS DE NIVEAU 2) ET OPTIMISATION ECONOMIQUE (FONCTIONS DE NIVEAU 3)]
Pierre Gaspart Jun. 1976 50 p In FRENCH Sponsored by Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-IN-3) Avail: NTIS HC A03/MF A01

In industrial process control, level 2 functions (numerical control) are aimed at keeping constant a number of process parameters linked to the computer, notwithstanding perturbations. A fixed value is given to each control parameter by the operators. The computer acts upon the industrial plant in order to maintain these values. Level 2 functions contribute to placing and maintaining the industrial plant in a state defined by the operators. Level 3 functions (economic optimization) produce a new dimension to computer intervention in that they suggest the fixed values to be adapted for minimizing an economic criterion such as cost price or energy consumption. ESA

N77-12777# Texas Univ., Austin. Electronics Research Center.
DESENSITIZED SPECIFIC OPTIMAL SYSTEM DESIGN UTILIZING DIGITAL SIMULATION BY PARTITIONING AND UNCOUPLING
Troy F. Henson and Baxter F. Womack 1 Dec. 1975 299 p refs
(Contract F44620-71-C-0091)
(AD-A025775; TR-176) Avail: NTIS HC A13/MF A01 CSCL 12/1

A digital-computer algorithm is developed for determining the 'desensitized optimal' design vector which results in a specific optimal system design that is relatively insensitive to variations in the uncertain plant model parameters. In order to obtain the solutions to the system and sensitivity state equations which are required by the algorithm, a technique of digital simulation by partitioning and uncoupling the system model is developed.
GRA

N77-12778# Naval Ship Research and Development Center, Bethesda, Md.
CONTROL THEORY WITH APPLICATIONS TO NAVAL HYDRODYNAMICS: THE FIRST DAVID W. TAYLOR LECTURES, APRIL 1972
Reinier Timman (Tech. Hogeschool, Delft Netherlands) Dec. 1975 76 p refs
(AD-A025702; DTNSRDC-4397) Avail: NTIS HC A05/MF A01 CSCL 13/10

The lectures present an introduction to modern control theory. Calculus of variations is used to study the problem of determining the optimal control for a deterministic system without constraints and for one with constraints. The method of dynamic programming is also used to solve the unconstrained control problem. Stochastic systems are introduced, and the Kalman-Bucy filter is derived.
Author (GRA)

N77-12779# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
CONTROL FOR LARGE SCALE AND UNCERTAIN SYSTEMS Interim Report, 1 Jan. 1975 - 1 Jan. 1976
Michael Athans and Sanjoy K. Mitter Mar. 1976 19 p refs (Grant AF-AFOSR-2273-72; AF Proj. 9769)
(AD-A025819; ESL-IR-651; AFOSR-76-0557TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

This research is concerned with various aspects of systems theory. Topics covered include: modelling and identification, linear and non-linear filtering, filtering for systems with time delay, stochastic and adaptive control, infinite dimensional systems. Applications of this work to various aerospace problems are indicated. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N77-12780 Drexel Univ., Philadelphia, Pa.
TOPICS IN THE APPLICATION OF SUMMATION METHODS Ph.D. Thesis
Robert Louis Higgins 1976 137 p
Avail: Univ. Microfilms Order No. 76-22412

Several classes of summation methods are developed. The properties of the methods which are examined include linearity, regularity, and performance on certain sequence spaces. Some of the methods are described through a sequence of suitably normalized polynomials which are orthogonal with respect to a Legesque-Stieltjes distribution d alpha (x), on1,1. The assumption of integrability for [alpha prime(x)]/(1-x2)1/2 leads to asymptotic descriptions of the orthogonal polynomials on the cut and to limiting properties for the coefficients of the orthogonal polynomials. Transformations are generated which are more useful computationally than the classical transformations when applied to sequences of random variables. Dissert. Abstr.

N77-12781 Washington State Univ., Pullman.
THE NUMERICAL SOLUTION OF THE EIGENVALUE PROBLEM FOR INTEGRAL OPERATORS USING THE METHOD OF PROJECTIONS Ph.D. Thesis
Jesse Yi-hsing Wang 1976 71 p
Avail: Univ. Microfilms Order No. 76-21401

Several generally applicable techniques for solving the integral eigenproblem numerically are discussed. The method of collocation with spline basis functions is fully demonstrated. The approximate eigenfunctions of the given problem are represented by splines and collocation is used to reduce the given problem to a standard matrix eigenvalue problem. The theoretical results show that if the eigenfunctions are smooth, then a high order convergence rate can be obtained with this approach even if the given compact integral operator has a weakly singular kernel. Several numerical examples demonstrate the use of this method and the Nystrom method. Dissert. Abstr.

N77-12782 Colorado Univ., Boulder.
FINITE LEAST SQUARES COLLOCATION METHOD Ph.D. Thesis
Ramakrishna Rao Boppana 1976 196 p
Avail: Univ. Microfilms Order No. 76-23593

A new numerical method which retains the main advantageous features of the two well known methods (finite difference and finite element methods) and is free from major difficulties is presented. Continuous isoparametric element interpolators are used as the element-wise interpolation functions in writing the least squares collocation differential/boundary residual equations at one or more element nodal points. Since the point-wise least squares error criterion is employed, no integration is required for the residual equation formulation. The interpolating isoparamet-

ric elements of the proposed method are overlapped in a manner similar to that of the finite difference stencils such that the explicit interelement boundaries and the continuity requirements, as known in the finite element method, disappear altogether. Due to the use of isoparametric element interpolators curved boundary conditions are satisfied more easily than in the finite difference method. Dissert. Abstr.

N77-12783 Syracuse Univ., N.Y.
PARALLEL ARITHMETIC USING SERIAL ARITHMETIC PROCESSORS Ph.D. Thesis
Jyh-Ming Jeremy Hsu 1975 126 p
Avail: Univ. Microfilms Order No. 76-18523

The properties of bit serial organized STARAN computer are analysed for bit parallel arithmetic operations. A mixed mode addressing scheme of the associative array memory is utlized such that all the bits of a number can be processed simultaneously. New algorithms for arithmetic operations are described and the simulation programs in APL are included. The execution speeds were measured and compared with the bit-serial operations by actual implementation in the STARAN. The signed digit number representations are discussed. Associative array structures which are part of a modified STARAN computer are proposed. Implementation of a specific signed digit number representation with radix-10 in this computer are discussed. New algorithms of signed digit arithmetic operations are simulated in APL for parallel processing and are included in the appendices.
Dissert. Abstr.

N77-12784 Rice Univ., Houston, Tex.
THE EXCHANGE PARTITION FUNCTIONS OF THE RIGID ASYMMETRIC TOP Ph.D. Thesis
Richard Francis Kayser, Jr. 1976 68 p
Avail: Univ. Microfilms Order No. 76-21687

Expressions for the direct and exchange partition functions of the rigid asymmetric top are obtained via the density matrix. By a method similar to one used in employing perturbation theory to infinite order, the exchange partitions may be written as double series. Extensive use is then made of the uniform properties of such series to show that the exchange partition functions are nonanalytic functions of beta = 1/kt at beta = 0. That is to say, the exchange partition functions go to zero with increasing temperature faster than any finite negative power of the temperature. At all but the lowest temperatures, the use of corrected Maxwell-Boltzmann statistics is an excellent approximation. A curious and previously unknown identity in generalized spherical functions was discovered. Dissert. Abstr.

N77-12785 California Univ., San Diego.
TOWARD A CONVERGENT PERTURBATION THEORY Ph.D. Thesis
David Joseph Malik 1976 70 p
Avail: Univ. Microfilms Order No. 76-22014

Three studies are presented: (1) a variational method for determining upper and lower bounds on the radius of convergence of the Born perturbation series is given. Accurate estimates are obtained with upper/lower bounds within 1% of the exact values; (2) a convergent perturbative method applicable to both elastic and inelastic scattering processes is developed. The method is based on the decomposition of the scattering kernel into separable and non-separable parts. The resolvent of the separable kernel can be analytically determined, and a rearranged Lippmann-Schwinger equation is given. A convergent series can be obtained if the rank of the separable kernel is extended; and (3) numerical examples using the GDW method for elastic scattering for several potentials are compared to the quasi-particle method of Weinberg. Numerical applications of inelastic scattering are also given for the collinear collision of an atom and a diatom. Dissert. Abstr.

N77-12786 Syracuse Univ., N.Y.
UNIFORM APPROXIMATION OF CONTINUOUS FUNCTIONS ON OPEN SUBSETS OF R TO THE m POWER Ph.D. Thesis
Artin B. Boghossian 1975 45 p
Avail: Univ. Microfilms Order No. 76-18494

Let G be an open subset of Rm, m greater than or equal to 1, and u be a real valued function having a positive infimum on each compact subset of G. The following theorem is proved: If f is a real valued continuous function on G, then there exists a function h harmonic in G x R. The proof of the theorem requires a crucial lemma concerning the uniform approximation by harmonic polynomials of functions which are continuous on certain compact subsets of Rm and harmonic in their interiors. The lemma is proved using tools of potential theory and results.
Dissert. Abstr.

N77-12787 Washington Univ., Seattle.
INDUCED REPRESENTATIONS AND POSITIVE LINEAR MAPS OF ORDINARY C-ALGEBRAS Ph.D. Thesis
James Gordon Bennett 1976 71 p
Avail: Univ. Microfilms Order No. 76-23063

Representations induced via completely positive maps of finite dimensional C^*-algebras, for which a complete classification is given satisfy a reciprocity theorem which includes the Frobenius theorem for finite groups. Other studies assume that the vector space is also a B-module satisfying certain other criteria requiring that assumption. The B-module assumption is here replaced by the requirement that the B-valued inner product be completely positive. The definition of complete positivity for inner products is inspired by the similar definition for linear maps and such linear maps can be used to construct vector spaces with the desired properties in a manner analogous to the usual construction of Hilbert spaces from positive linear functionals. Dissert. Abstr.

N77-12788*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Information Systems Div.
THE COVARIANCE MATRIX FOR THE SOLUTION VECTOR OF AN EQUALITY-CONSTRAINED LEAST-SQUARES PROBLEM
C. L. Lawson 15 Dec. 1976 18 p ref
(Contract NAS7-100)
(NASA-CR-149232; JPL-TM-33-807) Avail: NTIS HC A02/MF A01 CSCL 12A

Methods are given for computing the covariance matrix for the solution vector of an equality-constrained least squares problem. The methods are matched to the solution algorithms given in the book, 'Solving Least Squares Problems.' Author

N77-12789# Dynamics Research Corp., Wilmington, Mass. Systems Div.
NONLINEAR SPLINE METHOD FOR OPTIMAL THRUST VECTOR CONTROL ATMOSPHERIC INTERCEPTOR GUIDANCE
Harold Schneider and Parvathareddy B. Reddy 5 Apr. 1976 50 p refs Backup document for AIAA synoptic scheduled for publication in AIAA Journal in Mar. 1977
Avail: NTIS HC A03/MF A01

A nonlinear spline method is presented for optimizing the thrust vector controls needed in guiding an interceptor through dense atmosphere to intercept a target. The two point boundary value (TPBV) problem for obtaining the optimal interceptor controls is derived via the calculus of variations. The optimization technique for obtaining the solution utilizes integral methods, spline approximations, and a one or miltidimensional parameter search procedure to transform the optimality state and adjoint nonlinear differential equations with specified boundary conditions, into algebraic expressions. The boundary conditions at the initial and terminal times are satisfied algebraically on each sweep (iteration). A noniterative guidance law is obtained as an approximate solution to the TPBV problem. Computer results are presented for two dimensional atmospheric intercepts with fixed terminal time (fixed altitude of intercept), zero terminal miss distance, and a quadratic performance index consisting of the integral of the square of the thrust, which is a measure of fuel consumption.
Author

N77-12790# California Univ., Livermore. Lawrence Livermore Lab.
ANOTHER LOOK AT THE CONCEPT OF MODEL
G. C. Corynen 3 Mar. 1976 8 p refs Presented at IEEE Southeastern Conf., Knoxville, Tenn., Apr. 1976
(Contract W-7405-eng-48)
(UCRL-77896; Conf-760408-2) Avail: NTIS HC A02/MF A01

Initial results toward laying a mathematical foundation for the practice of modeling and simulation are presented. While

the concept of deterministic model has been addressed in an earlier work, a new look revealed the need to provide a more flexible framework, particularly in reference to the modeler of probabilistic situations. This paper attacks this problem and presents an initial view of a general model and a probabilistic model. Author (ERA)

N77-12791# Florence Univ. (Italy). Facolta d'Ingegneria.
ASYMPTOTIC PROPERTIES OF SOLUTIONS OF THE EQUATION y'=f(x)phi(y)
Vojislav Maric (Univ. di Novi Sad, Yugoslavia) 1975 9 p refs Presented at the Seminary of the Ist. di Mat. Appl., Florence, 2 May 1975
Avail: NTIS HC A02/MF A01

Sharp estimates of the solutions y(x) of the equation y'=f(x)phi(y) are given for x large under the hypothesis that y(x) being positive tends to zero for x tending to infinity and that f and G are positive continuous for x and y strictly positive. The demonstration of a fundamental theorem needed for the result makes use of the Bernstein definition of almost increasing resp. decreasing functions. ESA

N77-12792# Florence Univ. (Italy). Facolta d'Ingegneria.
INVARIANT MEASURES AND ITS APPLICATIONS
Andrzej Lasota (Krakow Univ.) 1975 14 p refs Presented at the Seminary of the Ist. di Mat. Appl., Florence, 25 Jun. 1975
Avail: NTIS HC A02/MF A01

It is demonstrated that for a piecewise C squared function T transforming the closed interval 0, 1 into itself, and provided that for a positive integer N a certain condition is satisfied, then there exists an absolutely continuous measure invariant under T. The condition is slightly stronger than Ulam's conjecture. The conditions to be satisfied to explicitly obtain the density of the invariant measure are given. Applications are given to rotary of rocks and to foundry casting mold cleaning. ESA

N77-12793# Florence Univ. (Italy). Facolta d'Ingegneria.
PERIODIC SOLUTIONS OF NONLINEAR HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS [SOLUTIONS PERIODIQUES D'EQUATIONS AUX DERIVEES PARTIELLES HYPERBOLIQUES NON LINEAIRES]
Jean Mawhin (Louvain Univ., Belg.) 1976 15 p refs In FRENCH Presented at the Seminary of the Ist. di Mat. Appl., Florence, 12 Feb. 1976
Avail: NTIS HC A02/MF A01

New results in solving the nonlinear hyperbolic partial differential equations of u sub tt - u sub xx = f(t, x, u, u sub t, u sub x) form are presented, namely, 2 Pi - periodic in t and x solutions, the periodicity in x being replaced by boundary conditions of Dirichlet or Neumann type. Scalar equations and one-dimensional space variables are only taken into account. ESA

N77-12794# Montpellier Univ. (France). Dept. de Physique Mathematique.
SOME EXAMPLES OF TRANSPARENT POTENTIALS IN THE CLASSICAL APPROXIMATION
Michel Cuer [1976] 11 p refs
(PM/76/6) Avail: NTIS HC A02/MF A01

Classes and examples of potentials which give a classical deflection function equal to zero (mod 2n pi) for any value of the impact parameter at a fixed energy are given. These potentials are completely transparent for a classical collision at this energy. Author (ESA)

N77-12795# Geological Survey, Denver, Colo.
AN OPTIMAL METHOD FOR EVALUATING A CLASS OF CONVOLUTION INTEGRALS WITH RELATED KERNELS Final Report
Walter L. Anderson 1976 16 p refs
(PB-251156/6; USGS-GD-76-003) Avail: NTIS HC A02/MF A01 CSCL 12A

A FORTRAN 4 algorithm is described for optimally evaluating certain classes of convolution integrals containing related kernel functions. Fourier (sine, cosine) or Hankel (J sub 0), (J sub 1) transforms with related input kernels are evaluated efficiently, and without loss of accuracy, using an extension of a digital filtering algorithm. The optimal method is accomplished by use of special written external subprograms, and therefore, does not require any modifications to the existing filter algorithms. A simple FORTRAN coding example is given illustrating the essence of the new algorithm. GRA

N77-12796# Florida Univ., Gainesville. Dept. of Industrial and Systems Engineering.
A SUBGRADIENT PROCEDURE FOR THE SOLUTION OF MINIMAX LOCATION PROBLEMS
Donald Hearn Mar. 1976 27 p refs
(Contract DAHC04-75-G-0150; Grant NSF ENG-74-22159; DA Proj. 2O0-41102-A-14D)
(AD-A025288; RR-76-6; ARO-12640.5-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

A heuristic subgradient algorithm is presented for the solution of minimax location problems involving Euclidean and rectilinear distances. An attractive feature is the ease of implementation. Computation comparison with existing methods shows up to 90% savings in computer time. Author (GRA)

N77-12797# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
SOLVING NEARBY INTEGER PROGRAMS
Robert G. Jeroslow 26 Apr. 1976 13 p refs
(Contract N00014-75-C-0621; NR Proj. 047-408)
(AD-A025606; RR-392) Avail: NTIS HC A02/MF A01 CSCL 12/2

Two elementary principles are provided for rapidly obtaining efficient solutions to integer programs that are 'nearby' a given integer program, in the sense that the right-hand-sides can often be made near the given right-hand-side. These results also supply a sensitivity analysis for integer programs. GRA

N77-12798# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
REPRESENTATIONS OF UNBOUNDED OPTIMIZATIONS AS INTEGER PROGRAMS
Robert G. Jeroslow Apr. 1976 17 p refs
(Contract N00014-75-C-0621; NR Proj. 047-048)
(AD-A025603; RR-389) Avail: NTIS HC A02/MF A01 CSCL 12/2

Any optimization problem in a finite structure can be represented as an integer or mixed-integer program in integral quantities. It is shown that when an optimization problem on an unbounded structure has such a representation, it is 'very close' to a linear programming problem, in the specific sense described in the following results. It is also shown that, if an optimization problem has such a representation, no more than (n - 2) equality constraints need be used, where n is the number of variables of the problem. GRA

N77-12799# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
WORST-CASE ANALYSIS OF A NEW HEURISTIC FOR THE TRAVELLING SALESMAN PROBLEM
Nicos Christofides Feb. 1976 11 p refs Sponsored in part by ONR
(AD-A025602; RR-388; WP-62-75-76) Avail: NTIS HC A02/MF A01 CSCL 12/2

An O(n sup 3) heuristic algorithm is described for solving n-city travelling salesman problems (TSP) whose cost matrix satisfies the triangularity condition. The algorithm involves as substeps the computation of a shortest spanning tree of the graph G defining the TSP, and the finding of a minimum cost perfect matching of a certain induced subgraph of G. A worst-case analysis of this heuristic shows that the ratio of the answer obtained to the optimum TSP solution is strictly less than 3/2. This represents a 50% reduction over the value 2 which was the previously best known such ratio for the performance of other polynomial-growth algorithms for the TSP. GRA

N77-12800# Naval Surface Weapons Center, White Oak, Md.
METHODS FOR SOLVING THE VISCOELASTICITY EQUATIONS FOR CYLINDER AND SPHERE PROBLEMS
G. C. Gaunaurd Mar. 1976 45 p refs
(MAT Proj. 03L-000; ZR00001010)
(AD-A025302; NSWC/WOL/TR-76-20) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report considers techniques used to solve the Navier field equations of viscoelasticity in the Kelvin-Voigt or Maxwell models, for cylindrical or spherical geometries. Introducing scalar and vector potentials into the viscoelasticity equations formulation, ultimately yields telegraph-type partial differential equations governing those potentials. For harmonic time-dependence, these reduce to scalar and vector Helmholtz's equations with complex propagation constants. These constants are shown to be related to the viscoelastic material-constants in a more or less complicated fashion depending on the viscoelastic model used. The stresses, strains and displacements are then found from these potentials for a dozen cases of interest in those two coordinate systems. The formulation resembles that of electrodynamics in a Coulomb gauge. The above information is vital to set-up and solve various kinds of boundary-value-problems of dynamic viscoelasticity which appear when studying cases of acoustic scattering from sound-absorbing structures. GRA

N77-12801# Washington Univ., Seattle. Dept. of Electrical Engineering.
THE PARABOLIC CYLINDER FUNCTIONS OF MILLER'S SECOND KIND FOR COMPLEX PARAMETER Quarterly Report, 1 Sep. 1975 - 31 Jan. 1976
R. B. Smith 29 Feb. 1976 26 p refs
(Contract N00123-73-C-1200)
(AD-A025314) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report describes the derivation of some properties of the Parabolic Cylinder Functions e(a,z) and E*(a,z). These functions are a natural choice for expressing the solutions of the coupled-mode equations for the Tapered Coupler which is important in integrated optics and fiber optics coupling. The parabolic cylinder functions W(a, + or - z), e(a,z) and e*(a,z), originally defined only for real arguments, are considered when a and z are complex. Due to a choice of notation the original defining expressions do not remain valid when the parameter, a, is complex as required for the tapered coupler. Alternative expressions which are generally valid are obtained from the function of the first kind, U(a,z). It is found that these functions of the second kind are not analytic throughout the finite plane of a, as is allowed by the defining differential equation. Rather, they have multiple branches (four) and the half integer points along the imaginary axis are all branch points. Three-term recurrence relations (of which the couples-mode equations for the tapered coupler are a special case) are obtained for the functions E(a,z), but cannot be uniformly valid throughout the complex a-plane. Within either the right or left half of the complex plane, and on the real axis, these functions have useful applications, but their singular properties may discourage their full acceptance as standard parabolic cylinder functions. GRA

N77-12802# Texas A&M Univ., College Station.
SQUARE-ROOT RATIO ESTIMATION
Omer C. Jenkins May 1976 20 p refs
(Contract DAHC04-74-C-0018)
(AD-A025241; ARO-8049.15-M; TR-16) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this paper is to extend the use of the square-root estimator to the estimation of the ratio of the means of a bivariate population. GRA

N77-12803# North Carolina Univ., Chapel Hill. Dept. of Statistics.
A GUIDE TO THE BURR TYPE XII DISTRIBUTIONS
Robert N. Rodriguez Apr. 1976 15 p refs Sponsored in part by NSF
(Contract DAHC04-74-C-0030)
(AD-A025242; Mimeo-Ser-1064; ARO-11959.7-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Diagrams of areas in the (square root of (Beta sub 1), Beta sub 2) plane corresponding to the Burr Type 12 distributions are presented. GRA

N77-12804# Naval Postgraduate School, Monterey, Calif.
A PROGRAM FOR THE NUMERICAL SOLUTION OF LARGE SPARSE SYSTEMS OF ALGEBRAIC AND IMPLICITLY DEFINED STIFF DIFFERENTIAL EQUATIONS Technical Report, Oct. 1975 - Apr. 1976
Richard Franke May 1976 60 p refs
(AD-A024764; NPS-53FE76051) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report documents a program for the numerical solution of large sparse systems of algebraic and implicitly defined stiff differential equations. The principal use is intended to be the solution of differential equations arising from time dependent partial differential equations when the finite element method is used to discretize the space domain. The use of compact matrix storage techniques and iteration for the solution of the quasi--Newton iterates in Gear's method makes the program extremely efficient both in terms of storage requirements and execution times. Author (GRA)

N77-12805# University of South Florida, Tampa. Dept. of Mathematics.
THE BEHAVIOR OF THE PADE TABLE FOR THE EXPONENTIAL Interim Report
E. B. Saff and R. S. Varga (Kent State Univ., Ohio) 1976 15 p
(Grants AF-AFOSR-74-2688; AF-AFOSR-74-2729; E(11-1)-2075; AF Proj. 9749)
(AD-A025099; AFOSR-76-0551TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper surveyed are recent results and new theorems on the behavior of Pade approximants for eZ. The new results include necessary and sufficient conditions for, (1) a sequence of approximants to be pole-free in an infinite sector, and (2) a sequence of approximants to vonverge geometrically in the uniform norm over an infinite sector. Author (GRA)

N77-12806# Naval Underwater Systems Center, New London, Conn.
A SOLVING ALGORITHM FOR SYSTEMS OF NONLINEAR ALGEBRAIC EQUATIONS
27 May 1976 27 p refs
(ZR0000101)
(AD-A025766; NUSC-TR-5353) Avail: NTIS HC A02/MF A01 CSCL 12/1

An exact solution algorithm for various systems of nonlinear algebraic equations is presented. Several applications of the method are given, and a discussion of the results in the context of nonlinear programming problems is included. GRA

N77-12807# Stanford Research Inst., Menlo Park, Calif.
APPLIED MATHEMATICS
K. M. Case, A. Despain, F. J. Dyson, and J. Katz Apr. 1976 38 p refs
(Contract DAHC15-73-C-0370; ARPA Order 2504)
(AD-A025791; SRI-JSR-75-13) Avail: NTIS HC A03/MF A01 CSCL 12/1

Topics discussed include the following: symbolic manipulation of mathematical expressions; handbooks on special functions; an amalgam; computing algorithms; information retrieval systems; multiphase flows; nonlinear partial differential equations; turbulence; models for summar symposia. GRA

N77-12808# Stanford Univ., Calif. Dept. of Statistics.
TWO RELATED GOODNESS-OF-FIT PROBLEMS WITH APPLICATIONS TO SPACINGS
Guido E. DelPino and Michael A. Stephens 2 Feb. 1976 17 p refs
(Contract N00014-67-A-0112-0085; NR Proj. 042-267)
(AD-A025699; SU-TR-230) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper shows the connection between two problems concerning goodness of fit. One of them has been of interest for a long time; the other has been given attention only recently. The connection to apply known results for the first problem to the second was made. GRA

N77-12809# Stanford Univ., Calif. Dept. of Science.
PEARSON CURVES REVISITED
H. Solomon and M. A. Stephens 5 Nov. 1975 39 p refs
(NR Proj. 042-267)
(AD-A025696; SU-TR-226) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report discusses the use of Pearson curves to give approximate percentage points to intractable distributions, when the first four moments (or three moments and one end-point)

are available. It is shown how to fit the curves, and their effectiveness is illustrated with a wide range of examples; they are in general shown to give excellent approximations in the long tail(s) of a distribution. Author (GRA)

N77-12810# IBM Watson Research Center, Yorktown Heights, N.Y.
NUMERICAL METHODS FOR STIFF NONLINEAR AND QUADRATIC DIFFERENTIAL EQUATIONS Interim Scientific Report, 1 Mar. 1975 - 29 Feb. 1976
W. Liniger Apr. 1976 13 p
(Contract F44620-75-C-0058; AF Proj. 9749)
(AD-A025200; AFOSR-76-0555TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

First, results are given concerning input-output stability and Liapunov variational stability of nonlinear multistep difference equations. They state that formulas which are A-stable, or possess other similar linear properties of unconditional fixed-h stability, are stable also when applied to certain representative classes of (eg, monotone) nonlinear differential systems. Second, a description is presented of the design, implementation, and testing of a collection of highly-accurate, A-stable and nonlinearly stable integration algorithms based on averaging. Third, results are provided establishing some basic theoretical properties of fractional linear difference schemes for the solution of systems of quadratic differential equations. GRA

N77-12811# Missouri Univ., Columbia. Dept. of Statistics.
CLASSIFICATION RULES FOR EXPONENTIAL POPULATIONS: TWO PARAMETER CASE
Asit P. Basu and A. K. Gupta Feb. 1976 23 p refs Prepared in cooperation with Michigan Univ., Ann Arbor
(Grant AF-AFOSR-2795-75; AF Proj. 9769)
(AD-A025181; TR-56; TR-3-AFOSR; AFOSR-76-0560TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper extends many of the results for one-parameter exponential distributions, considered by the authors earlier (Proc. Conf. Reliability and Biometry, 1974), to the case of the two parameter exponential distributions. In this paper the classification rules based on the likelihood-ratio criterion for the two-parameter exponential populations have been studied. These classification rules have been extended to many populations and to the situation where observations are censored. In cases where the likelihood-ratio criterion does not lead to appealing classification rules, ad hoc rules are proposed. An additional rule is considered from 'life testing' point of view. In each case, the probability of misclassification is derived exactly where the parameters are known. The rules considered have been shown to possess a consistency property. An alternate approach based on Bayesian considerations is also explored. Author (GRA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N77-12812 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE DEVELOPMENT AND MONTE CARLO INVESTIGATION OF NON-HIERARCHICAL CLUSTERING PROCEDURE, AND ITS APPLICATION TO DISCRIMINATION PROBLEMS IN INDUSTRIAL ADMINISTRATION Ph.D. Thesis
Roy James Shanker 1976 264 p
Avail: Univ. Microfilms Order No. 76-22328

A basic introduction to the field of cluster analysis is given, as well as a literature review of areas of application. The investigation and development of a modified Forgy-Jancey non-hierarchical clustering procedure by use of Monte Carlo techniques is developed. The clustering procedure is applied to problems of classification in industrial administration. Major new contributions to the field of non-hierarchical cluster analysis are discussed. To develop the Forgy-Jancey procedure, hypothesis testing techniques referenced to a linear model were used to compare several algorithm starting procedures, with the superior one chosen for further work. As well, a gradient step size for the algorithm was chosen by similar analysis. A linear function was also estimated to relate the characteristics of the data analyzed to the overall performance of the algorithm. Dissert. Abstr.

N77-12813 Temple Univ., Philadelphia, Pa.
SOME SEQUENTIAL DESIGNS FOR THE SELECTION OF THE BEST BINOMIAL POPULATION Ph.D. Thesis
Linda L. Arkles 1976 103 p
Avail: Univ. Microfilms Order No. 76-22076

The problem of selecting the best out of several binomial populations is considered in the framework of the Bechhofer sequential selection model with emphasis on the application to clinical trials where several treatments with dichotomous responses are being considered. Sequential sampling rules are proposed for situations of delayed response to treatment and of multiple-patient-entry. The selection procedures which employ these rules are compared to the ones which use the familiar Vector-at-a-Time, Play-the-Winner, and Play-the-Winner-Cyclical sampling rules in terms of the average sample number and the inferior treatment number. The cases of two and three populations are studied in detail where it is shown that the new sampling rules lead to improved selection procedures. Dissert. Abstr.

N77-12814 New Mexico Univ., Albuquerque.
APPLICATIONS OF GENERALIZED SPLINE FUNCTIONS TO EMPIRICAL BAYES ESTIMATION Ph.D. Thesis
Russell Vernon Lenth 1975 70 p
Avail: Univ. Microfilms Order No. 76-22154

The problem of empirical Bayes estimation with respect to squared-error loss is considered. Specifically, we have a sample x sub 1, x sub 2, x sub n in which the xi are distributed according to the (known) conditional density f (x; theta sub i and the theta sub i (unobservable) are distributed according to the (unknown) prior distribution g(theta). Lg-splines to obtain a smooth estimate of g, and use this to formulate an empirical Bayes estimator. Under reasonable conditions, the estimate of the prior density is consistent and asymptotically normal, and the corresponding empirical Bayes procedure is asymptotically optimal. Dissert. Abstr.

N77-12815 Syracuse Univ., N.Y.
CLASSIFICATION TECHNIQUES APPROPRIATE FOR UNEQUAL COVARIANCE MATRICES Ph.D. Thesis
William Lynch Curlette 1975 228 p
Avail: Univ. Microfilms Order No. 76-18504

Two classifiers were developed and five classifiers were compared for classification problems having two multivariate normal populations with unequal covariance matrices.The criterion for evaluating the classification techniques was the probability of correct classification when population parameters were estimated. With unequal calibration sample sizes, the generalized likelihood ratio criterion classifier usually performed best if the prior probabilities of population membership were equal. Also, given unequal calibration sample sizes, this classifier had the highest probability of correct classification when the prior probability of population membership favored the population with the smaller variances. When the larger prior was associated with the population which had the greater variances and calibration sample sizes were equal, the third minimum chi-square rule was recommended. Dissert. Abstr.

N77-12816 Rice Univ., Houston, Tex.
NONPARAMETRIC PROBABILITY DENSITY ESTIMATION BY OPTIMIZATION THEORETIC TECHNIQUES Ph.D. Thesis
David Warren Scott 1976 155 p
Avail: Univ. Microfilms Order No. 76-21710

Two techniques are discussed. The first is the kernel estimator. The problem of choosing the kernel scaling factor based solely on a random sample is addressed. An interactive mode is discussed and an algorithm proposed to choose the scaling factor automatically. In a Monte Carlo simulation study, the resulting integrated mean square error compares favorably with the error using the usual asymptotically optimal choice of the kernel scaling factor. For the latter case, the true sampling density is required to calculate the optimal scaling factor. The second nonparametric probability estimate uses penalty function techniques with the maximum likelihood criterion. A discrete maximum penalized

likelihood estimator is proposed and is shown to be consistent in the mean square error. Dissert. Abstr.

N77-12817 Temple Univ., Philadelphia, Pa.
A THREE PHASE MODEL FOR CONTROLLED CLINICAL TRIALS Ph.D. Thesis
Gaston Alberto Mendoza 1976 158 p
Avail: Univ. Microfilms Order No. 76-22114

A new model is proposed for the design of controlled clinical trials when a total of N patients are to receive one of two competing treatments. The proposed model is applied to normal, binomial and exponential responses. For the normal case, fixed sample size and sequential approaches are considered. Tables for the design of such plans are provided for the situation where the size of the delay phase is proportional to the size of the experimental phase. An algorithm is presented which allows one to obtain from these tables a near optimum design for more general delay functions. A numerical example is provided comparing the proposed model with the classical approach. This example illustrates that the classical approach can prove to be a poor choice in terms of the expected number of patients who will receive the superior treatment. Dissert. Abstr.

N77-12818# Florence Univ. (Italy). Ist. d'Elettronica.
SPECTRAL ESTIMATION WITH REDUCTION OF PROCESSED DATA
V. Cappellini and E. DelRe 1975 18 p refs Presented at the CNR Meeting on Data Transmission, Florence, 17 Oct. 1975
(R-2-75) Avail: NTIS HC A02/MF A01

It has been shown that finite impulse response (FIR) digital filters are the most suitable for reduction of the sampling rate and of the computation speed. A method of spectral analysis requiring a minimum number of data to be processed and leading to a computation structure of a FIR digital filter is described in detail. Author (ESA)

N77-12819# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
STOCHASTIC APPROXIMATION WITH CORRELATED DATA
David C. Farden and Louis L. Scharf Apr. 1976 30 p refs
(Contracts N66001-74-C-0035; N66001-75-C-0224; N00014-75-C-0518; ARPA Order 1872)
(AD-A024279) Avail: NTIS HC A03/MF A01 CSCL 12/1

New almost sure convergence results are developed for a special form of the multidimensional Robbins-Monro (RM) stochastic approximation procedure. The special form treated can be viewed as a stochastic approximation to the solution w = w sub o epsilon Rp of the linear equations Rw = P, where R is a pxp positive definite symmetric matrix. This special form commonly arises in adaptive signal processing applications. Essentially, previous convergence results for the RM procedure contain a common 'conditional expectation condition' which is extremely difficult (if not impossible) to satisfy when the 'training data' is a correlated sequence. In contrast, the new convergence results incorporate moment conditions and covariance function decay rate conditions. The ease with which these results can be applied in many cases is illustrated. GRA

N77-12820# Stanford Univ., Calif. Dept. of Statistics.
A TECHNIQUE FOR DETECTING THE NUMBER OF POPULATIONS FALLING WITHIN A TOTAL SAMPLE
Alan E. Gelfand 26 Mar. 1976 39 p refs
(Contract N00014-67-A-0112-0085; NR Proj. 042-267)
(AD-A025701; SU-TR-232) Avail: NTIS HC A03/MF A01 CSCL 12/1

Observations arrive in a sequence such that the first observation is taken from population 1, the second from population 2,..., the kth from population k, the k-1st from population 1, the k-2nd from population 2, etc.; i.e., the observations arrive in cycles of length k. A total of N observations is taken and we wish to estimate k. A technique, motivated by Analysis of Variance considerations, is suggested. It is examined with respect to an extensive simulation study which reveals its performance to be better than expected and better than two possible competitors. Author (GRA)

N77-12821# Stanford Univ., Calif. Dept. of Statistics.
A COMPARISON OF SEVERAL ATTRIBUTE SAMPLING PLANS
Alan E. Gelfand 1 Mar. 1976 25 p refs
(Contract N00014-67-A-0112-0085; NR Proj. 042-267)
(AD-A025700; SU-TR-231) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this research is to examine several types of procedures for attribute sampling inspection--the widely used Military Standard 105D plans, the lesser known Double Zero plans as developed by Ellis, and the Narrow Limit gaging plans of Ott and Mundel. Each of the procedures is described with an effort made to illuminate their more subtle features. Then the plans are compared whence it is revealed that (1) narrow Limit gaging plans have a serious weakness in comparison to the others and (2) double Zero plans tend to be essentially conservative but that sufficiently tight Military Standard 105D plans can be selected to achieve in all ways comparable performance. GRA

N77-12822# Massachusetts Inst. of Tech., Cambridge. Dept. of Mathematics.
A SUBJECT SELECTION PROBLEM EMPLOYING A NEW CRITERION
Herman Chernoff and Joseph Yahan (Tel Aviv Univ.) 28 May 1976 44 p refs
(Contract N00014-75-C-0555; NR Proj. 042-331)
(AD-A025803; TR-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

The extensive literature on Ranking and Selection procedures depends heavily on the use of two alternative criteria which are philosophically out of tune with the decision theoretic framework in which these papers are written. The authors propose a new criterion for selecting a subset of k populations and evaluate two subset selection procedures introduced respectively by Gupta and by Desu and Sobel in terms of this criterion. GRA

N77-12823# Stanford Univ., Calif. Dept. of Statistics
ESTIMATION OF PARAMETERS OF ZERO-ONE PROCESSES BY INTERVAL SAMPLING
M. Brown, H. Solomon, and M. A. Stephens 3 Dec. 1975 43 p refs
(Contract N00014-67-A-0112-0085; NR Proj. 042-267)
(AD-A025698; SU-TR-228) Avail: NTIS HC A03/MF A01 CSCL 12/1

Processes in which one of two states is available for observation occur in a number of diverse applications. Since we can label the occurrence of one of the states by zero and the other state by one, we refer to this situation as a zero-one process. These labels can reflect a zero-one natural situation or, as is more frequent, a categorized representation of the two states. What is at issue are estimation procedures to provide information about the two states. In this paper we consider the following specific problem although the estimation procedures we develop can be applied to a more general class of distributions. GRA

N77-12824# Michigan Univ., Ann Arbor. Dept. of Statistics.
EXACT AND APPROXIMATE BAYESIAN SOLUTIONS FOR INFERENCE ABOUT VARIANCE COMPONENTS AND MULTIVARIATE INADMISSIBILITY Final Technical Report, 1 May 1972 - 1 Jun. 1976
Bruce M. Hill Wright-Patterson AFB, Ohio AFFDL Feb. 1976 38 p refs
(Contract F33615-72-C-1213; AF Proj. 7071)
(AD-A025452; AFFDL-TR-75-134) Avail: NTIS HC A03/MF A01 CSCL 12/1

Exact and approximate Bayesian solutions for inference about variance components and multivariate inadmissibility are obtained, using a class of prior distributions which allows realistic forms of prior knowledge to be incorporated. Results are based upon new mathematical representations for the Appell and ordinary hypergeometric functions. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N77-12825# DARCOM Intern Training Center, Texarkana, Tex.
A REPLACEMENT POLICY FOR COMPONENTS OF A PURE SERIES SYSTEM UTILIZING ONE COMPONENT AS AN INDICATOR OF REPLACEMENT TIME Final Report
Michael G. Orrell May 1976 85 p refs
(AD-A024979; DARCOM-ITC-02-08-76-214) Avail: NTIS HC A05/MF A01 CSCL 15/5

The purpose of this paper is to develop a replacement policy. The policy will be for systems consisting of 'N' independently failing subsystems in a series configuration. The decision to replace a component of the system will be determined by a certain number of failures of another component in the system. This paper offers general equations adaptable for different time to failure distributions and it contains a specific example. The specific example is done showing all mathematical developments and results are given in tabular form. Finally, the replacement policy derived in the paper is compared to a more conventional replacement policy and the results show that the developed replacement policy's relative cost is approximately the same as the optimal solution. Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N77-12826 Wesleyan Univ., Middletown, Conn.
PURITY AND IMBEDDEDNESS IN ABELIAN TORSION GROUPS Ph.D. Thesis
William Peter Berlinghoff 1976 74 p
Avail: Univ. Microfilms Order No. 76-23698

Properties of imbeddedness in torsion groups paralleling several areas in the theory of pure subgroups are developed. It is shown that there are many imbedded subgroups which are not pure, with a wide range of deviation from isometry, but in at least one important instance the behavior of imbedded subgroups does not differ from that of pure subgroups. J. D. Moore conjectured that a group in which the closure of every imbedded subgroup is imbedded must be torsion complete; however, it is shown that this is not the case, and that in fact this imbeddedness condition and the apparently weaker purity condition are actually equivalent. Dissert. Abstr.

N77-12827 Wesleyan Univ., Middletown, Conn.
SYMBOLIC TRANSFORMATION GROUPS Ph.D. Thesis
Joseph Aloysius Auth, II 1976 63 p
Avail: Univ. Microfilms Order No. 76-23697

A generalization of the shift dynamical systems is studied; namely, the action of the integer on P sup Z, where P is a finite set of symbols, is generalized to an action of an arbitrary infinite discrete group T on P sup T. The three most useful references for this work are for topological dynamics, for symbolic dynamics, and for measure theory. Dissert. Abstr.

N77-12828# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
SET PARTITIONING: A SURVEY
Egon Balas and Manfred W. Padberg (New York Univ.) Feb. 1976 94 p refs
(Contract N00014-75-C-0621; Grant NSF MPS-73-08534; NR Proj. 047-048)
(AD-A025600; RR-386) Avail: NTIS HC A05/MF A01 CSCL 12/2

This paper discusses the set partitioning or equality-constrained set covering problem. It is a survey of theoretical results and solution methods for this problem. Part 1 gives some background material. Part 2 deals with structural properties of the set packing and set partitioning polytopes. Part 3 focuses on algorithms. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N77-12829 Georgia Inst. of Tech., Atlanta.
STABILITY ANALYSIS OF EXTENDED GYROSTATS Ph.D. Thesis
Luther Street Long, III 1976 142 p
Avail: Univ. Microfilms Order No. 76-22376

A mathematical analysis for the stability of spinning rigid bodies is presented. First, the stability of a general unsymmetrical rigid body with a fixed point was considered. Floquet's theory, Routh's solution, and Rumiantsev's analysis were applied to the problem to classify all regions within the limits of possible rigid bodies for the chosen parameter plane regarding their stability. Second, the same problem was extended to that of a gyrostat with a fixed point in which the effects of relative spin on the stability-instability regions of the previous problem were examined. A Routh-type analysis of the linearized equations and Rumiantsev's Lyapunov analysis were employed to yield stability-instability regions for the range of possible rigid bodies. Next, lateral inertia imbalance was introduced to the rotor of the gyrostat giving rise to a system we named an extended gyrostat. Dissert. Abstr.

N77-12830 British Library Lending Div., Boston Spa (England).
PRECISION STANDING COMPARISON BETWEEN REMOTELY SEPARATED TIME STANDARDS
R. Stecher 25 Feb. 1976 15 p refs Transl. into ENGLISH from Nachrichtentechnik (West Ger.), v. 17, no. 10, 1975 p 404-408
(BLL-DRIC-Trans-4307-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.

Measuring stations remotely separated from each other often require a common time basis with a variation that does not exceed 1 mu s at the individual stations. Procedures and apparatus for simultaneous determination of the constant differences at each station are described. Measurements are obtained by means of a radio link modified to eliminate the need for mobile relay equipment, by a common television transmitter, or by several transmitters with the same program. Cost factors are discussed. A.H.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N77-12831 Vanderbilt Univ., Nashville, Tenn.
PULSE ANALYSIS OF ACOUSTIC EMISSION SIGNALS Ph.D. Thesis
James Richard Houghton 1976 200 p
Avail: Univ. Microfilms Order No. 76-22345

A method for the signature analysis of pulses in the frequency domain and the time domain is presented. Fourier spectrum, Fourier transfer function, shock spectrum and shock spectrum ratio were examined in the frequency domain analysis and pulse shape deconvolution was developed for use in the time domain analysis. Comparisons of the relative performance of each analysis technique are made for the characterization of acoustic emission pulses recorded by a measuring system. To demonstrate the relative sensitivity of each of the methods to small changes in the pulse shape, signatures of computer modeled systems with analytical pulses are presented. Optimization techniques are developed and used to indicate the best design parameters values for deconvolution of the pulse shape. Several experiments are presented that test the pulse signature analysis methods on different acoustic emission sources. Dissert. Abstr.

N77-12832# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ACOUSTIC MEASUREMENT OF THE CIRCULATION OF VORTICES AND THE CIRCULATION DISTRIBUTIONS IN WIND TUNNEL MODEL INVESTIGATIONS

D. W. Schmidt 1975 107 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-61) Avail: NTIS HC A06/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 25

Based on the influence of a vortex on the running time of ultrasonic pulses in flows, a simple method for direct measurement of the circulation of the vortex was deduced and an acoustic circulation meter using this method developed. The instrument was tested by performing measurements in the flow around models of a rectangular wing and of a swept wing in the 3 m by 3 m AVA wind tunnel at velocities up to 30 m/sec. The measurements results proved, to a large degree, to be independent of practically all disturbing influences. The smallest values of measured circulation were about 0.1 sq m/sec. The time needed to measure a circulation distribution depends only on the time needed to position the microphones system which is mounted on the traversing apparatus of the wind tunnel (typical duration for the measurement of a circulation distribution consisting of 25 data points: 2 min). Author (ESA)

N77-12833# Institut Franco-Allemand de Recherches, St. Louis (France).
PORTABLE N WAVE GENERATORS OF DIFFERENT POWER FOR SIMULATION OF SONIC BOOMS [PORTABLE N-WELLEN-GENERATOREN UNTERSCHIEDLICHER LEISTUNG ZUR SIMULATION VON FLUGZEUGKANALLEN]
M. Froboese and G. Mathieu 24 Apr. 1975 57 p refs In GERMAN
(ISL-R-123/75) Avail: NTIS HC A04/MF A01

Three models of portable sound generators are described which can produce N-shaped and other detonation profiles via loudspeaker combinations in a test chamber. The equipment is used mainly for investigating the effect of sonic booms on small animals and test models. The most powerful simulator can produce a maximum sound pressure of about 6.5 mbar. The N-wave time can be extended to 400 ms in order to simulate sonic booms of military and passenger aircraft. ESA

N77-12834# Naval Underwater Systems Center, New London, Conn.
TIME DELAY ESTIMATION
G. Clifford Carter and Charles H. Knapp (Conn. Univ., Storrs, Conn.) 17 May 1976 32 p refs Presented at the IEEE Intern. Conf. on Acoustics, Speech, and Signal Processing, Philadelphia, 13 Apr. 1976
(AD-A025620; NUSC-TD-5389) Avail: NTIS HC A03/MF A01 CSCL 20/1

This document presents both the oral and written versions of a paper presented (in 15 minutes) on 13 April 1976 at the 1976 IEEE International Conference on Acoustics, Speech, and Signal Processing, in Philadelphia, Pennsylvania. A maximum likelihood (ML) estimator is derived for determining time delay between two signals observed in the presence of uncorrelated noise, under the assumptions of known signal and noise spectral characteristics. This ML estimator is derived for determining time delay between two signals observed in the presence of uncorrelated noise, under the assumptions of known signal and noise spectral characteristics. This ML estimator can be realized as a pair of receiver prefilters followed by a cross correlator. The time argument at which the correlator achieves a maximum is the delay estimate. Qualitatively, the role of the prefilters is to weight the signal passed to the correlator according to the strength of the coherence function. Other realizations of the ML processor are also discussed. The variance of a generalized correlation time delay estimator is derived when the estimate is in the neighborhood of the true delay. An example using these results is given with emphasis on the effect of erroneously specifying the frequency weighting to be employed. Limitations of the derived results are also discussed. Author (GRA)

N77-12835# Drexel Univ., Philadelphia, Pa.
A PROGRAM OF STUDY ON THE AGGREGATION OF MOLECULES AND THEIR EFFECT ON SOUND PROPAGATION Final Report
Richard B. Beard and Lester A. Kraus 10 Jun. 1976 15 p refs
(Contract N00014-67-A-0406)
(AD-A025767) Avail: NTIS HC A02/MF A01 CSCL 07/3

This final report outlines the accomplishments of the study of the aggregation of molecules and their effect on sound propagation. A theoretical approach has been developed to analyze non-linear sound propagation applicable to aggregating media. Experimental techniques such as dielectric relaxation over a frequency range of 100 Hz to 3 GHz, and ultrasonic vibration potential over a range of 0.2 to 2 MHz were developed. Measurements have been made on a micellar forming anionic paraffin chain salt sodium dodecyl sulfate, SDS, and a cationic paraffin chain salt dodecyl triammonium bromide, DTAB. A dielectric relaxation was found for SDS and DTAB attributed to a shell of interfacial water around the hydrocarbon core of the micelle. GRA

N77-12836# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
COMPUTATIONAL TECHNIQUES FOR THE STUDY OF INFRASOUND PROPAGATION IN THE ATMOSPHERE Final Report, 15 Oct. 1973 - 31 Dec. 1975
Allan D. Pierce and Wayne A. Kinney 13 Mar. 1976 187 p refs
(Contract F19628-74-C-0065; AF Proj. 7639)
(AD-A024951; AFGL-TR-76-0056) Avail: NTIS HC A09/MF A01 CSCL 20/1

A discussion is given of theoretical studies in infrasound propagation through the atmosphere which were carried out under the contract. Topics discussed include (1) modification and adaptation of a computer program for the prediction of pressure signatures at large distances from nuclear explosions to include leaking guided modes, (2) the nature of guided infrasonic modes at higher infrasonic frequencies and the methods of extending waveform synthesis procedures to include higher frequencies. and (3) the propagation of infrasonic pressure pulses past the antipodes over half-way around the globe. Summaries are included of all papers, theses, and reports written under the contract and conclusions and recommendations for future studies are given. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N77-12837 Princeton Univ., N.J.
MOLECULAR ORBITAL STUDIES OF ELECTRON DEFICIENT COMPOUNDS Ph.D. Thesis
James David Dill 1976 274 p
Avail: Univ. Microfilms Order No. 76-22633

Ab initio molecular orbital theory was used to determine geometric and electronic structures of small molecules containing lithium, beryllium, and boron. Geometries were optimized with the minimal STO-3G basis set; the polarized 6-31 G* basis was used along with the STO-3G geometries to determine stabilities and binding energies. The STO-3G structures and 4-31G/5-21G binding energies of positively-charged Lewis acid-base complexes involving Li, Be, and B were also determined, and phenyl cations were examined at STO-3G and 4-31G levels. Dissert. Abstr.

N77-12838 Princeton Univ., N.J.
QUANTUM MECHANICAL ANALYSIS OF INTRAMOLECULAR INTERACTIONS Ph.D. Thesis
Philip Warren Payne 1976 522 p
Avail: Univ. Microfilms Order No. 76-22623

Ab initio Hartree Fock molecular orbital theory is used for the analysis of nonbonded interactions as they are manifest in small molecule rotational barriers, of ethane, methylamine, propane, and ethylamine molecules. The physical origin of rotational barriers and the mechanisms through which substituents affect rotational barriers are explored in two complementary ways. Charge density difference analysis shows that conformational preference is determined through competition between the Pauli exclusion principle and forces of electrostatic polarization. This conclusion is corroborated by development of a procedure for

partitioning a molecular wavefunction in terms of wave functions for molecular fragments. Dissert. Abstr.

N77-12839 Johns Hopkins Univ., Baltimore, Md.
VARIATIONAL CALCULATIONS WITH HYPERSPHERICAL BASIS SETS ON ATOMIC HELIUM AND LITHIUM Ph.D. Thesis
Glenn Odis Morrell, Jr. 1976 148 p
Avail: Univ. Microfilms Order No. 76-22937

Expansions of N-electron atomic wavefunctions in hyperspherical coordinates are investigated with variational calculations for the ground states of helium and lithium. One basis is a complete set of functions in the 3N-1 angle variables and the hyperradius r. Calculated energies for helium agree to within 0.001 a.u. of Bunge's estimated angular limits but the rate of convergence is too slow to obtain arbitrary accuracy by increasing the basis size. Errors for lithium are much greater (approximately 0.4 to 0.5 a.u.). An alternate expansion using an overcomplete set of basis functions in some of the angular variables is proposed. Results for helium show improvement in the energy with fewer total terms in the expansion. Methods for calculating expectation values and electron densities for wavefunctions in hyperspherical coordinates are developed, and various expectation values are determined for helium and lithium; also radial distribution functions are determined for some of the lithium wavefunctions. Dissert. Abstr.

N77-12840 Polytechnic Inst. of New York, Brooklyn.
ION BINDING STUDIES OF POLYSULFONATES Ph.D. Thesis
Pei-Ching Chen 1976 156 p
Avail: Univ. Microfilms Order No. 76-23399

The purpose was the development of a different method estimating the selectivity coefficients of alkali metal ions on the two anionic polysulfonates, polystyrene sulfonates (NaPSS), and polyethylene sulfonates (NaPES). Results showed that the selectivity coefficients are consistently higher in the NaPES solutions at all levels of concentration. This means that the binding of barium ions is stronger in the NaPES solutions than that in NaPSS solutions. There are two reasons for this difference. The first is the configuration effect of the phenyl groups in NaPSS and the second is the water structure effect. Dissert. Abstr.

N77-12841*# Scientific Translation Service, Santa Barbara, Calif.
METHOD FOR ISOTOPE SEPARATION
I. Nebenzahl and M. Levin Washington NASA Jul. 1976 17 p Transl. into ENGLISH from German Patent 2,312,194, 4 Oct. 1973 p 1-14
(Grant NAS7-100)
(NASA-TT-F-16743) Avail: NTIS HC A02/MF A01 CSCL 07D

A five step process is described for isotope separation by selective excitation and ionization of elements having two or more isotopes. Photoionization is produced by a higher power tunable laser which provides the proper number of photons and is adjusted for ionization of pre-excited atoms. An electrical field is used to remove and collect the ionized atoms. Electron mobility and charge exchange tresholds are calculated. A.H.

N77-12842# Westfield Coll., London (England). Dept. of Physics.
SPIN DEPENDENCE AT VERY HIGH ENERGIES IN AN EIKONAL PICTURE OF pp ELASTIC SCATTERING
C. Bourrely, E. Leader, and D. Wray [1975] 13 p refs Sponsored by Sci. Res. Council
Avail: NTIS HC A02/MF A01

An improved theoretical eikonal model for the spin dependence in pp elastic scattering at very high energies is presented. The model corresponds to a unitarity type sum of ladder diagrams and the resultant spin structure has quite remarkable properties. Author (ESA)

N77-12843# Westfield Coll., London (England). Dept. of Physics.
TWO PARTICLE UNITARY FOR HELICITY AMPLITUDES WITH PARTICLES OF ARBITRARY SPIN
John M. Charap (Queen Mary Coll., London) and Elliot Leader Jun. 1976 45 p refs Submitted for publication Sponsored by Sci. Res. Council
Avail: NTIS HC A03/MF A01

The two particle unitary contribution to the double spectral function of the scattering amplitude for any 2 yields 2 process is explicitly calculated for the case of arbitrary spins of the initial, intermediate and final particles. Closed, simple result is obtained which is a generalization of the Mandelstam result for spinless particles. The results should be of value in calculations of the contribution of the exchange of pairs of high spin particles to the nucleon-nucleon force. Author (ESA)

N77-12844*# National Bureau of Standards, Washington, D.C.
RESONANCE LINES AND ENERGY LEVELS OF Cs3, Ba4, AND La5 Final Report
Gabriel L. Epstein and Joseph Reader 16 Jan. 1976 10 p refs Repr. from J. Opt. Soc. Am., v 66, no. 6, Jun. 1976 p 590-598 Submitted for publication Sponsored by NASA
(NASA-CR-149207; PB-255672/8) Avail: NTIS HC A02/MF A01 CSCL 07D

The spectra of Cs 3, Ba 4, and La 5 have been observed in a sliding spark discharge on the 10.7 m normal incidence vacuum spectrograph at NBS, and the energy levels were determined. The energy parameters determined from a least squares fit to the observed level values are compared with Hartree-Fock calculations. GRA

N77-12845# Rochester Univ., N.Y.
INTENSE PULSE PHENOMENA Final Report, 1 Jun. 1973 - 14 Feb. 1976
Joseph H. Eberly May 1976 10 p refs
(Grants DA-ARO(D)-31-124-73-G16; DAHC04-75-G-0084)
(AD-A025483; ARO-8915.20-P) Avail: NTIS HC A02/MF A01 CSCL 07/4

Theoretical and experimental studies were undertaken to better understand aspects of the interaction of intense light pulses with atomic and molecular matter. These studies fell into three categories: Theories of the light-matter interaction, experimental studies in large organic molecules and studies of realistic model systems of light emitters. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiations*

N77-12846 Rice Univ., Houston, Tex.
THE SUPERHYPERFINE STRUCTURE OF A SYSTEM EXHIBITING THE DYNAMIC JAHN-TELLER EFFECT: CaF2:Sc(2+) Ph.D. Thesis
Rafael Maza Mier 1976 231 p
Avail: Univ. Microfilms Order No. 76-21696

The superhyperfine (S.H.F.) interaction between the ground vibronic doublet state of Sc(2+) and the nuclear spins of the eight nearest flourine (I = 1/2) neighbors in CaF2 has been studied by E.P.R. using large applied uniaxial stress. The analysis of the S.H.F. structure employs an effective Hamiltonian derived from group theory. The experimentally determined parameters are: alpha 1/g1beta = 1.62 + or - 0.1 Gause alpha 2/g 1 beta = 1.67 + or - 0.23 Gauss, q alpha 3/g 1 beta = 1.77 + or - 0.08 Gauss, q alpha 4/g 1 beta = 1.24 + or - 0.12 Gauss (g alpha 5/g 1 beta less than or equal to 0.58 Gauss. Neighboring nuclei spin flips were observed during E.P.R. transitions. Probabilities for all S.H.F. lines were predicted within experimental accuracy and computer reconstructions of the large stress S.H.F. spectra were made. L.C.A.O.:M.O. were used to obtain a crystal field Hamiltonian which was compared with the symmetry-determined Hamiltonian and the observed parameters. Agreements and discrepancies are discussed. Dissert. Abstr.

N77-12847*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONPROPULSIVE APPLICATIONS OF ION BEAMS

W. R. Hudson 1976 16 p refs Presented at the 12th Intern. Elec. Propulsion Conf., Key Biscayne, Fla., 15-17 Nov. 1976; sponsored by AIAA
(NASA-TM-X-73511; E-8851) Avail: NTIS HC A02/MF A01 CSCL 20J

Eight centimeter ion beam sources utilizing xenon and argon have been developed that operate over a wide range of beam energies and currents. Three types of processes have been studied: sputter deposition, ion beam machining, and ion beam surface texturing. The broad range of source operating conditions allows optimum sputter deposition of various materials. An ion beam source was used to ion mill laser reflection holograms using photoresist patterns on silicon. Ion beam texturing was tried with many materials and has a multitude of potential applications. Author

N77-12848# Montpellier Univ. (France). Dept. de Physique Mathematique.
PHENOMENOLOGY OF LEPTON PRODUCTION
F. M. Renard Jun. 1976 40 p refs Presented at the 7th Intern. Seminar on Theoret. Phys., L'Escala, Spain, 7-12 Jun. 1976
(PM/76/5) Avail: NTIS HC A03/MF A01

Lepton production from hadronic collisions is reviewed. The Drell-Yan model for continuous lepton+ lepton- production is discussed, including the parton-antiparton annihilation mechanism, scaling forms, and relationship with deep inelastic scattering. Vector mesons and clusters are dealt with and other sources of direct leptons such as charmed particles, heavy leptons, and weak bosons are presented. ESA

74 OPTICS

Includes light phenomena.

N77-12849 Utah Univ., Salt Lake City.
DIGITAL COLOR IMAGE PROCESSING AND PSYCHOPHYSICS WITHIN THE FRAMEWORK OF A HUMAN VISUAL MODEL Ph.D. Thesis
Olivier Dominique Faugeras 1976 132 p
Avail: Univ. Microfilms Order No. 76-23261

A three-dimensional homomorphic model of human color vision based on neurophysiological and psychophysical evidence is presented. This model permits the quantitative definition of perceptually important parameters such as brightness, saturation, hue and strength. By modelling neural interaction in the human visual system as three linear filters operating on perceptual quantities, this model accounts for the automatic gain control properties of the eye and for brightness and color contrast effects. In relation to color contrast effects, a psychophysical experiment was performed. It utilized a high quality color television monitor driven by a general purpose digital computer. Conclusions are drawn about the implications of this research from the standpoint of psychophysics and of digital image processing. Dissert. Abstr.

N77-12850 Delaware Univ., Newark.
LUMINESCENCE PROPERTIES OF CYCLIC POLYNITRAMINES Ph.D. Thesis
Paul Lawrence Marinkas 1976 132 p
Avail: Univ. Microfilms Order No. 76-20560

Optical absorption measurements have confirmed the reports of earlier workers that the solid forms of the cyclic polynitramines known as RDX and HMX have a weak absorption band in the near ultraviolet which is not observed in spectra of the solvated compounds. Fluorescence measurements on solid samples of these materials show a weak emission, the excitation spectrum of which corresponds to this absorption band. The fluorescence is also not observed in the solvated compounds. Phosphorescence measurements on the solids reveal a long-lived emission, the excitation spectrum again corresponding to the band observed in absorption and fluorescence excitation. The lifetime of this emission was found to be substantially increased by deuteration. The absorption and luminescence bands are attributed to charge-transfer self-complexation in the solid state, and estimates of the charge-transfer singlet and triplet excited state energies are given. Dissert Abstr.

N77-12851 Syracuse Univ., N.Y.
INVESTIGATION OF VACUUM DEPOSITION PROCESSES BY OPTICAL EMISSION SPECTROSCOPY Ph.D. Thesis
Chih-Shun Lu 1975 107 p
Avail: Univ. Microfilms Order No. 76-18537

An experimental system which employs crossed electron and atom beams and a piezoelectric quartz crystal microbalance for monitoring the deposition rate has been developed to measure the excitation functions of evaporants. The noble metals (Cu, Ag and Au) have been selected for extensive examinations. The emission spectra of noble metals in the wavelength region between 2,000 and 5,000 A have been obtained with electron excitation energy at 33 eV. The intensities of a particular emission line as a function of deposition rate have been measured for each metal with a fixed electron energy of 48 eV. The emission intensity versus deposition rate curves do not obey a simple linear relationship because of the self-absorption of resonance radiation and the temperature dependence of deposition rate with respect to the number density of atoms in the vapor. Dissert. Abstr.

N77-12852 Arizona Univ., Tucson.
IMAGERY UTILIZING MULTIPLE FOCAL PLANES Ph.D. Thesis
Richard Edward Wagner 1976 170 p
Avail: Univ. Microfilms Order No. 76-22482

The signal-to-noise ratio of the detection device, its resolution, and the integration time necessary to achieve these requirements are determined. It is shown how criteria for these requirements can be treated in terms of the statistics of the random wavefront perturbations, the size of the optics, and the source radiance. This analysis is especially suited for describing the imagery produced by active wavefront compensation devices designed to reduce the effects of atmospheric turbulence. The trade-offs between hardware design and image quality are described by considering the active compensation device as a linear filter for the wavefront perturbations caused by atmospheric turbulence. The compensated wavefront contains residual wavefront errors whose statistics are estimated by the linear filter representation. The resulting imagery, degraded by the residual wavefront errors, requires post-processing. A method of post processing of the imagery is suggested. Dissert. Abstr.

N77-12853 Arizona Univ., Tucson.
IMAGE QUALITY THROUGH THE ATMOSPHERE Ph.D. Thesis
Wayne Warren Metheny 1976 178 p
Avail: Univ. Microfilms Order No. 76-22483

A measurement technique using a two point source transmitter is developed from fundamental considerations which can be applied to the measurement of the ATF or the atmospheric pupil function. The specific application of a down looking, airborne camera is chosen for a detailed error analysis of the technique. A ground test over a 3.5 mile and a 600 foot horizontal path is described. Calculations of the ATF for various geometries are considered. Both long exposure time calculations (using a new model of the outer scale) and intermediate exposure time calculations (using computer generated sample wavefronts) are made. Dissert. Abstr.

N77-12854 Polytechnic Inst. of New York.
TWO-PHOTON CORRELATIONS IN A WIDELY DIVERGENT LIGHT BEAM Ph.D. Thesis
Sigrid Renee McAfee Turner 1976 126 p
Avail: Univ. Microfilms Order No. 76-23432

The difference in time of arrival between single photon events at two photomultipliers was measured in a quasimonochromatic spatially coherent, widely divergent light beam. A chaotic (Gaussian) light source was provided by a pure Ne-20 discharge tube filled to a pressure of 1.6-Torr and operated at a current of 15-milliamperes. The spatial coherence was below a preassigned value, say 18%, known as the coherence angle, theta sub c. This angle is given by (lambda/a) where lambda is the (mean) wavelength of the light and a is the diameter of the first aperture, and for decreasing source aperture sizes yields increased coherence angles. This coherence angle can in turn be related to an angular coherence volume (steradians-meter) which is independent of the plane of observation. The results from the four runs of coherence angles 6-, 58-, 117- and

292-milliradians showed reasonable agreement between the measured and predicted time distribution. Dissert. Abstr.

N77-12855 Texas Univ. Health Science Center, San Antonio.
SPECTRAL EFFECTS ON CROSS-SECTIONAL RECONSTRUCTION FROM X-RAYS Ph.D. Thesis
William Doss McDavid 1976 185 p
Avail: Univ. Microfilms Order No. 76-22025

Effects associated with the polychromaticity of X-ray beams utilized in computerized axial tomography were investigated. Computer programs were developed to reconstruct a two-dimensional array of linear attenuation coefficients from a series of one-dimensional intensity transmission profiles measured at equally-spaced angular positions spanning a range of 180 deg. Two of the most prominent techniques for reconstruction from projections were used: (1) an algebraic reconstruction technique (ART) and (2) the convolution method. Other programs were developed to simulate transmission data for both monoenergetic beams and X-ray spectra generated under varying conditions of filtration, kVp, and voltage wave-form. The optimization of radiation parameters in order to produce the most satisfactory image in terms of contrast, noise level, and spatial independence was also investigated. Dissert. Abstr.

N77-12856# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF THE ABSORPTION COEFFICIENTS OF Ge AND MgF2 IN THE ULTRAVIOLET, VISIBLE, AND NEAR-INFRARED SPECTRUM RANGES IN THE 300 - 800 K BAND
A. N. Vinnikova 1976 6 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii. Priborostr. (Leningrad), v. 19, no. 9, 1976 p 105-110
Avail: NTIS HC A01/MF A01; National Translations Center, John Crerar Library, Chicago, Illinois 60616

An experimental apparatus is described for the measurement of the absorption coefficient of solid materials in the 190 to 2500 nm spectrum and 300 to 800 K temperature ranges. A MPS-50L double-beam spectrophotometer is used. Measurements are given for the absorptivity of single-crystal germanium and polycrystalline magnesium fluoride in the 300 to 800 K temperature range. Author

N77-12857*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEORY OF THIN SCREEN SCINTILLATIONS FOR A SPHERICAL WAVE
L. C. Lee Nov. 1976 24 p refs Submitted for publication
(NASA-TM-X-71225; X-602-76-257) Avail: NTIS HC A02/MF A01 CSCL 20F

A thin screen scintillation theory for a spherical wave is presented under the 'quasi-optical' approximation. We calculate the 'scattering angle', the 'observed angle', the intensity correlation function and the temporal pulse broadening for the random wave. It is found that as the wave propagates outward away from the phase screen, the correlation scale of the intensity fluctuation increases linearly while the 'observed angle' decreases linearly. The calculations are carried out for both Gaussian and power-law spectra of the turbulent medium. Author

N77-12858# Rockwell International Corp., Anaheim, Calif. Missile Systems Div.
SILICON MONOLITHIC INFRARED DETECTOR ARRAY
N. Sclar, R. L. Maddox, and R. A. Florence 1 Oct. 1976 25 p refs
(X76-1117/034A) Avail: NTIS HC A03/MF A01

Impurity doped silicon detector arrays sensitive to long infrared wavelengths, based on monolithic processing, were designed and developed to minimize electrical and optical crosstalk, provide precise optical definition of the detectors and utilize optimized infrared transparent detector contacts and reflecting counter-electrodes. The microelectronic batch processing procedures are discussed, and the array performance obtained using these procedures is presented. This includes spectral response, the dependence of detectivity on temperature and frequency, the electrical and optical crosstalk, and the optical definition obtained. The development is expected to serve as a processing guide for future arrays which will include on-ship signal processing.Author

N77-12859*# Montevallo Research Associates, Ala.
VIGNETTING CHARACTERISTICS OF THE S-056 X-RAY TELESCOPE Final Report
J. William Foreman, Jr. and Joseph M. Cardone Apr. 1976 21 p refs
(Contract NAS8-31996)
(NASA-CR-150107) Avail: NTIS HC A02/MF A01 CSCL 20F

A ray trace analysis of the vignetting characteristics of the S-056 X ray telescope is presented. The relative energy is calculated in the spot formed in the focal plane of the S-056 X ray telescope by an off axis point source at infinity for off axis angles of 0, 1, 2, ..., 35 arc minutes. At each off axis angle, the relative energies are evaluated using theoretical X ray reflectivity curves for wavelengths of 8.34 A, 17.57 A, and 27.39 A, and also using an experimental X ray reflectivity curve for 8.34 A. The effects of vignetting due purely to the geometry of the S-056 optical system are evaluated separately, as well as jointly with the effects of mirror reflectivity. Author

N77-12860# Army Aeromedical Research Unit, Fort Rucker, Ala.
LENS MATERIAL EVALUATION (GOGGLES, SUN, WIND, AND DUST) Final Report
Isaac Behar and Roger W. Wiley May 1976 25 p refs
(AD-A025778; USAARL-76-20) Avail: NTIS HC A02/MF A01 CSCL 06/17

Optical evaluations of lenses considered as candidates to replace the visor in the combat vehicle crewman's protective goggles are described. The four areas of optical evaluation were: spectral transmission, haze, optical distortion, and abrasion resistance. All of the lenses were found to have adequate properties of transmissivity and freedom from haze. However, none of the lenses submitted for evaluation were medically acceptable because of excessive optical distortion. The optical coatings under consideration to increase scratch resistance of the polycarbonate lenses provided only negligible improvement. If polycarbonate is determined to be the material of choice, a higher optical quality should be used, and a better method of providing abrasion resistance should be sought. GRA

N77-12861# Spectronics, Inc., Richardson, Tex.
OPTOELECTRONIC DEVICES PACKAGED FOR FIBER OPTICS APPLICATION, VOLUME 1 Final Report, Jul. 1973 - May 1975
J. R. Biard Apr. 1976 132 p refs
(Contract N00163-73-C-0544)
(AD-A025905; NAFI-TR-2072-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09/1

This document has been prepared to describe the development of a packaging concept for LEDs and photodiode detectors that is optimized for use in fiber optic data transmission systems. The package outline is the same for both LEDs and photodiodes. A total of 250 LEDs and 250 photodiodes was fabricated, tested and delivered to NAFI. The LEDs achieved power outputs to 3.0mW at 100mA bias. This report constitutes the first of a two volume set describing the work related to development of optoelectronic devices and packaging for fiber optics applications. The second volume describes modifications to the package to achieve a hermetic seal and the development of a reliable technique for accurately positioning and soldering the component package into the optoelectronic termination assembly. 200 LEDs and 200 photodiodes were inserted and soldered into the terminating assemblies. GRA

N77-12862# Texas A&M Univ., College Station. Dept. of Physics.
ASYMPTOTIC RADIANCE AND POLARIZATION IN OPTICALLY THICK MEDIA: OCEAN AND CLOUDS
George W. Kattawar and Gilbert N. Plass 11 May 1976 41 p refs
(Contract N00014-75-C-0537; NR Proj. 083-036)
(AD-A025107; TR-8) Avail: NTIS HC A03/MF A01 CSCL 20/6

Deep in a homogeneous medium that both scatters and absorbs photons, such as a cloud, the ocean, or a thick planetary atmosphere, the radiance decreases exponentially with depth and the angular dependence of the radiance and polarization is

independent of depth. In this diffusion region, the asymptotic radiance and polarization are also independent of the incident distribution of radiation at the upper surface of the medium. An exact expression is derived for the asymptotic radiance and polarization for Rayleigh scattering. The approximate expression for the asymptotic radiance derived from the scalar theory is shown to be in error by as much as 16.4%. An exact expression is also derived for the relation between the diffusion exponent, k, and the single scattering albedo. A method is developed for the numerical calculation of the asymptotic radiance and polarization for any scattering matrix. Results are given for scattering from the haze L and cloud C.3 distributions for a wide range of single scattering albedos. When the absorption is large, the polarization in the diffusion region approaches the values obtained for single scattered photons, while the radiance approaches the value calculated from the expression: phase function divided by (1 - k micrometers), where micrometers is the cosine of the zenith angle. The asymptotic distribution of the radiation is of interest since it depends only on the inherent optical properties of the medium. It is, however, difficult to observe when the absorption is large, because of the very low radiance values in the diffusion region. GRA

N77-12863# Hughes Aircraft Co., Culver City, Calif.
REFLECTIVE COATINGS RELIABILITY STUDY
Apr. 1976 59 p
(Contract DAAH01-75-C-1212)
(AD-A025757; HAC-P76-77; HAC-Ref-D4878) Avail: NTIS HC A04/MF A01 CSCL 20/6

The objective of this study was to quantify and document the degradation of three reflective optical coatings under simulated environmental conditions generally representative of those to be encountered by the coatings in high energy laser systems applications. The objective of this study included the identification of the relative importance of specific environments on the selected coatings. Three types of reflective coatings were proposed for this study: Gold (Au), Silver with Thorium Tetrafluoride overcoating (Ag-ThF4) and a multilayer dielectric coating (MLD) consisting of (ZnSe-ThF4). GRA

N77-12864# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Electrical Engineering and Applied Physics.
DESIGN, CONSTRUCTION AND EVALUATION OF A HIGH PRESSURE, HIGH ELECTRIC FIELD OPTOACOUSTIC DETECTOR Final Report, 23 Jun. - 31 Dec. 1975
Yoh- Han Pao and Paul C. Claspy 10 Mar. 1976 35 p refs
(Contract DAHC04-75-C-0198)
(AD-A025772; ARO-13456.1-AP) Avail: NTIS HC A03/MF A01 CSCL 20/6

A high pressure, high electric field optoacoustic detector system has been designed, constructed and evaluated. The system consists of an incoherent infrared radiation source, a prism/monochromator combination for wavelength tuning purposes, a high pressure gas cell with CaF2 windows, an internal sensitive microphone and amplifier assembly, a radiation chopper and high voltage electric feed-through and electrodes. It has been determined that the cell can operate up to internal gas pressures of 40 atmospheres and up to electric fields of 30 kv/cm. A preliminary study of the dependence of optoacoustic signal on pressure has been carried out and these results are also reported herein. There is the possibility of using this equipment to determine basic parameters characterizing the collision and/or electric field induced infrared absorption cross-sections for homonuclear diatomic molecules such as hydrogen, nitrogen and oxygen. If those cross-sections are reasonably large, a new type of high energy laser might be made available. GRA

N77-12865# Army Electronics Command, Fort Monmouth, N.J.
ERROR ANALYSIS OF MINIMUM INFORMATION AND SMITH'S DIRECT METHODS FOR INVERTING THE RADIATIVE TRANSFER EQUATION
Elton P. Avara Apr. 1976 69 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A025478; ECOM-5591) Avail: NTIS HC A04/MF A01 CSCL 17/5

Two iterative methods for inverting the integral form of the radiative transfer equation to obtain temperature profiles from satellite infrared radiance measurements were subjected to a detailed analytical investigation. The two methods are the minimum information method and Smith's direct method. Under the assumption that the radiance measurement errors were Gaussian with mean zero and known variance, each method was investigated to determine the effects of these errors upon the retrieved temperatures. The convergence characteristics and frequency response to differences between the true temperature profile and the first guess temperature profile were investigated for each method. Details of the investigation and the results are presented in the report. Author (GRA)

N77-12866# Naval Weapons Center, China Lake, Calif.
LOW EFFICIENCY DIFFRACTION GRATING THEORY Final Report
J. M. Elson Kirtland AFB, N. Mex. AFWL Mar. 1976 133 p refs
(AF Proj. 3326)
(AD-A024804; AFWL-TR-75-210) Avail: NTIS HC A07/MF A01 CSCL 20/6

The scattering of light from low efficiency reflective diffraction gratings is theoretically analyzed using a first-order perturbation technique. While results are concerned primarily with radiation of 10.6 micrometer wavelength, the theory is valid for all wavelengths for which the dielectric constant of the grating is negative. Results apply to grating groove profiles of arbitrary shape in the low efficiency region. Included are analyses of diffraction from bare gratings, from gratings overcoated with a single dielectric layer and from gratings with multiple dielectric layers. Consideration is also given to diffuse scattering from random roughness superimposed on the perfectly formed grating groove profile and to coupling of the incident beam energy into surface waves. GRA

N77-12867# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.
RESEARCH AND DEVELOPMENT IN GLASS TECHNOLOGY RELATED TO FIBER OPTIC WAVEGUIDES Final Report
26 Nov. 1975 95 p refs
(Contract N00123-74-C-1411)
(AD-A025660) Avail: NTIS HC A05/MF A01 CSCL 20/6

It was the purpose of this effort to use certain basic research results which indicated that it was possible to produce from phase separated glasses optical waveguide fibers with attenuations below 20 dB/Km and numerical apertures greater than available by chemical vapor deposition methods. Before the specific NELC applications for this fiber could be realized in commercial production, certain process engineering steps had to be solved. These production problems and the effort on each are discussed in the report. GRA

N77-12868# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
ABSORPTANCE CALCULATIONS FOR A MULTILAYER ABSORBING STACK: APPLICATION TO THIN FILM PHOTOCONDUCTOR ASSEMBLIES Interim Report
David A. Lilly 5 Mar. 1976 32 p refs
(Contract F04701-75-C-0076)
(AD-A025798; TR-0076(6270-20)-5; SAMSO-TR-76-79) Avail: NTIS HC A03/MF A01 CSCL 17/5

A generalized matrix method is developed to calculate the absorptance of electromagnetic radiation in each layer of a multilayer absorbing stack. As an example, the method is used to obtain the optical properties of a conventional multilayer stack, when one layer of the stack is a thin-film photoconductor. Two models describing the photoconductor film are used for the calculations. In one model, the photoconductor is a homogeneous, specularly reflecting film across which phase coherence is preserved. In the other, the photoconductor is an absorbing film across which phase coherence is not preserved. The results indicate that complex optical properties can be expected from these stacks and that detailed calculations are necessary in the optical design of such multilayers. GRA

N77-12869# Boeing Aerospace Co., Seattle, Wash.
DESIGN HANDBOOK FOR IMAGERY INTERPRETATION EQUIPMENT
Richard J. Farrell and John M. Booth Dec. 1975 760 p refs
(AD-A025453; D180-19063-1) Avail: NTIS

HC A99/MF A01 CSCL 20/6

This handbook is a major revision of an earlier document, The Human Engineering Design Guide for Image Interpretation Equipment. The handbook is intended to give the reader ready access to information on those equipment design features that have a major influence on the performance of imagery interpretation tasks. The data that are presented have been extracted largely from the technical literature on vision, human engineering, and interpretation performance studies. GRA

N77-12870# Hughes Research Labs., Malibu, Calif.
PREDETECTION COMPENSATED IMAGING Final Technical Report, 16 Sep. 1974 - 15 Aug. 1975
C. J. Swigert, W. P. Brown, T. R. OMeara, D. Y. Tseng, and S. Wandzura Griffiss AFB, N. Y. RADC Apr. 1976 129 p refs (Contract F30602-75-C-0026; ARPA Order 2646; AF Proj. 2646)
(AD-A025190; RADC-TR-76-112) Avail: NTIS HC A07/MF A01 CSCL 20/6

This report describes the techniques developed and evaluated for predetection compensated imaging systems to measure and correct wavefront distortions at a telescope aperture. One approach to compensate these wavefront distortions is to introduce the appropriate (real-time) wavefront correction ahead of the image formation process. We call systems that achieve such corrections Imaging COAT (Coherent Optical Adaptive Techniques) systems, since they are spatially coherent systems. Two general classes of wavefront error sensors have been identified and explored in this study. We have also examined several wavefront perturbation techniques (multidither techniques) that allow a detector to operate in a time shared mode to collect the wavefront error data that would normally require the use of several detectors using a nonperturbation mode of operation. This technique has been developed and refined into the Multiple Aperture InterLinked (MAIL) predetection compensation system. When advantageous, we use the MAIL concept for predictive track of multiple phase layers to obtain an extended integration time; otherwise, we rely on 'quick looks' of the phase error while viewing a bright target. GRA

N77-12871# RCA Labs., Princeton, N.J.
IMAGE DESCRIPTORS FOR DISPLAY Annual Report, 10 Dec. 1974 - 9 Dec. 1975
Roger W. Cohen, Curtis R. Carlson, and George D. Cody May 1976 248 p refs
(Contract N00014-74-C-0184; NR Proj. 213-120)
(AD-A024960; PRRL-76-CR-5; ONR-CR213-120-2) Avail: NTIS HC A11/MF A01 CSCL 20/6

This annual report summarizes our research on the display of visual information to the human observer. The research has been focused on three areas: (1) the development of a mathematical model that includes the current psychophysical understanding of perception and that is capable of dealing with displays that are both analog and sampled, noiseless and noisy; (2) the acquisition of the psychophysical data that is necessary for testing the model in a variety of real environments; (3) the testing of the model and the descriptors that emerge from it in a limited number of well-chosen experiments, as well as the 30 years or so of experience with the television system. GRA

N77-12872# Army Night Vision Lab., Fort Belvoir, Va.
THE DEVELOPMENT OF THIN FILM PHOTODETECTORS FOR THE 8-14 MICROMETER ATMOSPHERIC WINDOW
Robert E. Callender and Robert E. Flannery 1976 13 p refs
(AD-A025984) Avail: NTIS HC A02/MF A01 CSCL 17/5

Passive infrared imaging systems have become increasingly important for tactical warfare. The acceptance and growing capabilities of these imaging systems has caused increased demand for even higher-performance systems, with a decrease in the cost per detector. The Night Vision Laboratory is working to make a wider region to tradeoff between cost and performance available to the systems designer. A dramatic increase in performance can be achieved by increasing the number of detectors in the focal plane by at least an order of magnitude. However, the cost of these future, very-high-density imaging systems would be prohibitive if they were produced using present-day technology. The cost of the detectors plus their associated electronics can be reduced by developing a detector technology suitable for use with in-focal-plane CCD signal processing. In order to achieve minimum complexity and power dissipation, the signal from the detector must be directly injected into the CCD's. High-impedance detectors are required for direct-injection CCD interfacing. However, the high-performance 8-14 micrometer detectors used in current systems are low-impedance photoconductive devices, requiring buffer amplifiers. The only high-performance 8-14 micrometer detector with sufficiently high impedance at 77 K for direct signal injection into CCD signal processors is photovoltaic PbSnTe. GRA

N77-12873# White Sands Missile Range, N.Mex. Instrumentation Directorate.
AN ADAPTIVE PREDICTION FILTER ALGORITHM FOR OPTIMIZING SERVO SYSTEM PERFORMANCE
Lester M. Bradley 1976 15 p
(AD-A025980) Avail: NTIS HC A02/MF A01 CSCL 17/8

Several approaches have been taken by the Instrumentation Directorate over the past few years to improve the servo performance of various types of optical tracking telescopes. These efforts have concentrated on servo systems having sample rates between 20 and 200 per second where the original approaches centered around using analog techniques to implement lag-lead compensation networks comprised of R-C networks and operational amplifiers. Around 1970, efforts were successful in utilizing a special purpose mini-computer to implement a purely digital servo compensation as called for from a sampled-data analysis. In 1974, a compensation method was devised that used a non-linear gain relationship of the servo error signal to control a high performance mirror mount with a system sample rate of 200 per second. A mini-computer was used to implement the compensation and excellent performance results were obtained. This approach suggested that different methods could be used for servo control than had previously been tried and that such techniques could provide satisfactory servo performance. The experience gained from these earlier approaches coupled with the technique to be described have resulted in the development of an Adaptive Prediction Filter (APF) which allows a simple procedure to be followed in compensating a servo system and yields an optimum performance. Author (GRA)

N77-12874# Little (Arthur D.), Inc., Cambridge, Mass.
IR OPTICAL WAVE GUIDE Final Report, Feb. 1973 - May 1976
J. S. Haggerty and W. L. Robbins May 1976 39 p refs
(Contract N00014-73-C-0263; ARPA Order 2327)
(AD-A025953) Avail: NTIS HC A03/MF A01 CSCL 20/6

Techniques are described by which AS2Se3 glass fibers were drawn and characterized. The fibers were designed to transmit a single or at most a few optical modes of 10.6 micrometers radiation. The fibers were characterized optically and physically. Optical characterization included measurement of optical absorption coefficient. The drawing process was found well controlled and functioned according to glass drawing theory. The optical absorption coefficient was adversely effected by the materials handling procedures which were utilized; however, it was demonstrated that low loss fibers can be drawn by this process. Further work is required to identify the nature of the dominant absorption coefficient and its origin in the fiber drawing process. Author (GRA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N77-12875 California Univ., Los Angeles.
MEASUREMENT OF EXCITATION FUNCTIONS FOR CHARGED PARTICLE REACTIONS WITH GASES Ph.D. Thesis
David Richard Metcalf 1976 191 p
Avail: Univ. Microfilms Order No. 76-22207

The measurements were performed with a stacked gas target. The gas was introduced between accurately spaced parallel foils for charged particle irradiation. The recoiling product nuclei were

collected on catcher foils for assay by gamma ray spectrometry. The charged particle beam energy was measured by charged particle spectrometry, and the beam current was monitored by a copper foil activation method. The methods described provide an accurate means of measuring excitation functions for charged particle reactions with gases. The accuracy is comparable to that seen with solid target methods. The methods used in these measurements can be applied to any gas target provided that the reaction product is not a gas. Dissert. Abstr.

N77-12876# Indian Inst. of Tech., Bombay. Dept. of Mathematics.

MHD OSCILLATORY FLOW PAST A SEMI-INFINITE FLAT PLATE

V. M. Soundalgekar and H. S. Takhar 23 Aug. 1976 26 p refs Backup document for AIAA Synoptic, "MHD Oscillatory Flow Past a Semi-Infinite Plate", scheduled for publication in AIAA Journal in Apr. 1977

Avail: NTIS HC A03/MF A01

A theoretical investigation of MHD boundary layer response to harmonic oscillations in velocity associated with a progressive wave imposed on an otherwise constant free stream velocity and converted in the freestream direction has been carried out. Series solutions for small values of the amplitude and the frequency are derived, and the resulting set of equations is integrated numerically on computer. The functions affecting the flow are shown graphically. Expressions for time-average skin-friction and rate of heat transfer are derived, and it is observed that due to oscillatory free stream, the skin-friction decreases, and the rate of heat transfer increases with increasing M, the magnetic field parameter. Author

N77-12877# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).

THE BEHAVIOUR OF IMPURITIES IN A STEADY-STATE DT GAS-BLANKET REACTOR

J. A. Markvoort Nov. 1975 37 p refs Sponsored in part by Neth. Organ. for Pure Sci. Res. (ZWO), and EURATOM

(Rept-75-90) Avail: NTIS HC A03/MF A01

A four-fluid model of a cylindrical steady-state DT gas-blanket reactor was analyzed. The four fluids were electrons, deuterium-tritium, helium, and a high-Z impurity. In this model the fuel supply, a 50/50 deuterium-tritium mixture and the ash removal take place by diffusion while the fusion energy is carried off by heat conduction in addition to neutron radiation and bremsstrahlung. The radial temperature gradient and an externally applied magnetic field perpendicular to it give rise to a thermal force (the Nernst effect) which drives a poloidal current. The behavior of the plasma is described by the multi-fluid MHD equations, which are numerically solved with the aid of a Runge Kutta method. Whether impurities tend to concentrate on the axis was found to depend on how, in the collision term, the Nernst effect is taken into account. In order to show the influence of the Nernst terms arising from electron-ion collisions and the Nernst terms due to ion-ion collisions separately, the thermal force was dealt with in two ways. In model A only the contribution from electron-ion collisions was considered while in model B, which is more realistic, the ion-ion collisions were included. The computer calculation, as well as the theoretical analysis, show that the influence of the thermoforce due to ion-ion collisions on the density profiles dominates over the force due to electron-ion collisions and lead to a minimum in the impurity density on the axis. Author (ESA)

N77-12878# California Univ., Los Angeles. Plasma Physics Group.

RELATIVISTIC EFFECTS IN RESONANCE ABSORPTION

J. F. Drake and Y. C. Lee May 1976 31 p refs

(Contract N00014-75-C-0476)

(AD-A025192; APG-262) Avail: NTIS HC A03/MF A01 CSCL 20/8

The role of the relativistic-electron-mass variation in the generation of plasma waves by the linear mode-conversion of intense electromagnetic waves is investigated. The increase in the electron mass in high intensity regions of the mode-converted wave reduces the local plasma frequency and thereby strongly modifies the plasma-driver resonance. A spatial discontinuity in the structure of the mode-converted wave results and causes the wave to break. Under rather modest restrictions, the wave breaking resulting from these effects occurs before the wave amplitude is limited either by thermal convection or by breaking caused by previously investigated nonrelativistic effects. Consequently the amplitude of the mode-converted plasma wave should saturate at a much lower level than previously predicted. For simplicity, the analysis is limited to initial stages of mode conversion where the ion dynamics can be neglected. The validity of this approximation is discussed. Author (GRA)

N77-12879# Stanford Univ., Calif. High Temperature Gasdynamics Lab.

LIMITING MECHANISMS IN MHD GENERATOR PERFORMANCE Final Report, 15 Nov. 1971 - 15 May 1975

Dec. 1975 127 p refs

(Contract F33615-72-C-1088; AF Proj. 3145)

(AD-A025949; SU-HTGL-104; AFAPL-TR-76-21) Avail: NTIS HC A07/MF A01 CSCL 10/2

Experimental and analytical studies were undertaken to investigate loss mechanisms in MHD generators associated with the boundary layers and the electrodes. Measurements were made of the electrode boundary layer profiles of velocity, static temperature, and electron number density in an operating MHD generator for both subsonic and supersonic flows. Good agreement with a theory which included MHD effects was obtained for subsonic flow and somewhat less satisfactory agreement for supersonic flow where three-dimensional effects were thought to be significant. A theory was developed for predicting boundary layer parameters on the insulating wall of an MHD generator. It was shown that for high power density application of interest to the Air Force, separation may occur as a result of the non-uniform current distribution in the magnetic field direction. The Hall field breakdown between adjacent electrodes was investigated and the importance of the interelectrode gap width was demonstrated. Voltages considerably in excess of the standard 40 volts per electrode pair (or per centimeter) were obtained for the larger gaps, and the importance of the insulator in the breakdown mechanism was postulated. Transient start-up performance of MHD generators was modelled analytically, and it was shown that by suitably controlling the design and thermal capacitance of the electrodes, the generator power response can be tailored to meet the requirements for the pulsed operation studied. GRA

N77-12880# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.

LASER DIAGNOSTICS OF LASER-PRODUCED PLASMAS Interim Report

P. W. Chan, R. J. Churchill, R. C. Hazelton, S. R. Kimberlin, and E. S. Mina Jul. 1975 38 p refs

(Contract F19628-70-C-0035; Grant NSF ENG-74-18623; AF Proj. 7260; Proj. THEMIS)

(AD-A024936; AFCRL-TR-75-0634; SR-14) Avail: NTIS HC A03/MF A01 CSCL 20/9

Light scattering and holographic interferometry diagnostics using a ruby laser source have been applied to study a CO2 laser-induced argon breakdown with peak power density estimates at approximately 5 x 10 to the 9th power W per sq cm at subatmospheric pressures. Light scattering results indicate well defined but asymmetric ion-acoustic peaks. Assuming Maxwellian velocity distributions for the ions and the electrons, the ion temperature is estimated to be 4.3 eV and the electron temperature 43 eV at 200 ns after spark into be 4.3 eV and the electron temperature 43 eV at 200 ns after spark initiation. However, there is indication that the scattered intensity is above thermal so that the Maxwellian velocity assumption may not be valid. The asymmetry of the ion peaks indicates a relative drift of the electrons with respect to the ions. In addition, a Doppler shift of the entire scattered spectrum is also observed. Holographic interferometry provides three-dimensional density profile of the laser peak spark at several gas pressures and different times after spark initiation. The pressure-dependence studies show that high electron densities are produced at high pressures due to larger absorption and smaller plasma dimensions. The temporal dependence indicates that at the peak of the CO2 pulse, the plasma produces a sharp shock front (high density, low temperature) followed by a period of minimum on-axis electron density, resulting from local laser heating of the plasma. GRA

N77-12881# Naval Research Lab., Washington, D.C. Plasma Physics Div.
LASER RADIATION FORCES IN MAGNETIZED PLASMAS
John A. Stamper and S. E. Bodner May 1976 8 p refs
(Contract AT(04-3)-878; NRL Proj. H02-29A)
(AD-A025003; NRL-MR-3285) Avail: NTIS HC A02/MF A01 CSCL 10/9

A linearly polarized laser beam produces a time-averaged radiative force along its electric vector when interacting with a magnetized plasma. This magnetic force, for a field of 5 MG, is as large as the ponderomotive force with a gradient scale of 3 micrometers. Author (GRA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N77-12882 Northeastern Univ., Boston, Mass.
INVESTIGATION OF ANHARMONIC SELF-ENERGIES IN SOME IONIC AND DISPLACIVE FERROELECTRIC SOLIDS Ph.D. Thesis
Asnok Rastogi 1975 409 p
Avail: Univ. Microfilms Order No. 76-18065

A theoretical and experimental investigation of the nature and magnitudes of the complex anharmonic self-energies associated with the q approximately equal to 0 transverse optic modes in simple ionic crystals and in displacive ferroelectrics is presented. Lattice dynamical calculations of the eigenvectors and eigenfrequencies of the normal modes of vibration for all of the alkali halides crystallizing in the NaCl structure using a number of different models are also reviewed. This data is then used as harmonic input data for calculations of the complex anharmonic self-energies associated with the q approximately equal to 0 transverse optic modes in these materials. The calculations use the thermodynamic Green's function theory of anharmonicity. The calculations reveal the full frequency and temperature dependence of the anharmonic self-energies. Dissert. Abstr.

N77-12883 Polytechnic Inst. of New York.
HIGH ORDER BORRMANN DIFFRACTION Ph.D. Thesis
Martin Herbert Tillinger 1976 110 p
Avail: Univ. Microfilms Order No. 76-23453

An investigation of high order simultaneous Borrmann diffraction is carried out. The dynamical equations are solved numerically on a digital computer. Various improvements in the computer techniques are made for reliable results on the large matrices that are to be obtained. Detailed studies of the (220)/(220) 4 beam case and the (202)/(220) 6-beams case are studied parametrically using three wave lengths (Cr,Cu,Mo), two crystals (Ge,Si), and two temperatures (90K,293K). The calculated minimum absorption coefficients are given. Dissert. Abstr.

N77-12884 California Inst. of Tech., Pasadena.
SURFACE EFFECTS ON SPINWAVE RESONANCE IN THIN MAGNETIC FILMS Ph.D. Thesis
O. Glenn Ramer 1976 155 p
Avail: Univ. Microfilms Order No. 76-23117

Two phenomenological magnetic boundary conditions are discussed in detail. The wave vectors are easily found by combining the Landau-Lifshitz equations with Maxwell's equations. Mode positions are most easily predicted from the magnetic wave vectors obtained by neglecting damping, conductivity, and the displacement current. The properties of magnetic garnet materials are summarized, and the properties believed associated with the two surface regions of a YIG film are presented. Finally, the experimental data and calculated data for the surface layer model and other proposed models are compared. The conclusion of this study is that remarkable variety of spinwave spectra that arises from various preparation techniques and subsequent treatments can be explained by surface regions with magnetic properties different from the bulk. Dissert. Abstr.

N77-12885 Johns Hopkins Univ., Baltimore, Md.
ELECTRON IMPACT EXCITATION OF MOLECULAR NITROGEN: HIGH ENERGY-RESOLUTION STUDIES OF ELECTRON IMPACT OPTICAL EXCITATION FUNCTIONS OF THE FIRST POSITIVE SYSTEM Ph.D. Thesis
Ron Carter Estler 1976 76 p
Avail: Univ. Microfilms Order No. 76-22915

The relative emission cross sections for the (4,1), (4,2), and (5,2) bands of the N2 first positive system were measured in the threshold region using a high energy resolution electron spectrometer coupled to an optical detection system. The maxima in the relative emission cross section for the (4,1) and the (4,2) bands occurred at 10.68 plus or minus 0.08 eV. Structure was observed in the excitation functions which arose from the presence of channels for the population of the N2B super 3 Pi gamma state other than direct excitation by electron impact at certain energies. The contribution from C3 Pi upsilon yields B3 Pi gamma cascade is the major source of additional B3 Pi gamma state population. The contribution from this process reaches a maximum at an incident electron energy near 14 eV. Dissert. Abstr.

N77-12886 Syracuse Univ., N.Y.
ANALYSIS OF CARRIER CONCENTRATION AND MOBILITY IN BORON-DOPED SILICON Ph.D. Thesis
Timothy Tarek Braggins 1975 94 p
Avail: Univ. Microfilms Order No. 76-18496

The carrier concentration and mobility, as measured by the Hall effect, were analyzed by computer for a series of boron-doped silicon samples with impurity densities between 10 to the 13th power/cu cm and 10 to the 16th power/cu cm. The determination of the density of compensating donors from both types of analysis was in good agreement. The effect of the non-parabolicity of the silicon valence band on the temperature dependence of the mobility was investigated. Good agreement as to the temperature dependence of the mobility was found when the valence band non-parabolicity was taken into account. Scattering by ionized and neutral impurities and acoustic and optical phonons was included in the mobility analysis. Dissert. Abstr.

N77-12887 Pennsylvania Univ., Philadelphia.
RESONANCE-ENHANCED ALLOWED, FIELD-INDUCED AND WAVE-VECTOR-DEPENDENT RAMAN SCATTERING FROM THE SURFACE REGION OF InAs Ph.D. Thesis
Stephen Peter Brian Buchner 1976 150 p
Avail: Univ. Microfilms Order No. 76-22662

Resonance-enhanced Raman scattering by elementary excitations from the surface regions of both n- and p-InAs was studied. Since the energy of the incident radiation was close to the E sub 1 electronic gap, the light was strongly attenuated and penetrated only a few hundred angstroms into the crystal so that the skin depth of the incident radiation was comparable to the width of the surface space charge region. Dissert. Abstr.

N77-12888 Pennsylvania Univ., Philadelphia.
A MOESSBAUER STUDY OF Sn(2+)-DOPED EUROPIUM MONOCHALCOGENIDES AND A NEW LOOK AT THE EXPERIMENTAL FOUNDATIONS OF SPIN-WAVE THEORY Ph.D. Thesis
Nicholas Bykovetz 1976 270 p
Avail: Univ. Microfilms Order No. 76-22663

EuS, EuSe, and EuTe (but not EuO) were found to form solid solutions with the corresponding tin monochalcogenides for concentration up to at least 10 mole percent. Transferred hyperfine fields (approximately 50 KOe) were observed to exist at the tin nuclei through the use of Mossbauer spectroscopy. It proved possible to show that the source of the tin fields resides in the 2nd Eu neighbors to the tin (i.e., that the tin fields are supertransferred). A reanalysis of the experimental foundation of spin-wave theory was carried out. This project was motivated by the tin field studies. It proved possible to show that the magnetic behavior of all simple magnets can be explained by a simple noninteracting spin-wave theory, which differs drastically from the standard spin wave approach. Dissert. Abstr.

N77-12889 Georgia Inst. of Tech., Atlanta.
THE SYNTHESIS, MAGNETIC STUDIES, AND SINGLE CRYSTAL X-RAY DIFFRACTION STRUCTURES OF POLYNUCLEAR COPPER (I) OXIME IMINES OF 2, 3-BUTANEDI-

ONE Ph.D. Thesis
John Howard Smith 1976 148 p
Avail: Univ. Microfilms Order No. 76-22822

Polynuclear complexes of copper (II) with several oxime imines of 2,3-butanedione have been synthesized, characterized by elemental analysis and infrared spectra, analyzed magnetically at various temperatures, and examined by single crystal X-ray diffraction to determine their crystal and molecular structures. Copper-copper distances in all cases are large enough to minimize direct metal exchange and insure that any spin coupling is due to superexchange. The single crystal X-ray diffraction structures reveal four different polynuclear structures with bridging oxime groups. The paramagnetic and antiferromagnetic properties of these and previously reported copper (II) bridging oxime compounds are explained by the molecular orbital approach.
Dissert. Abstr.

N77-12890 Pennsylvania Univ., Philadelphia.
AXIAL EFFECTS IN PLANAR COMPLEXES: IRON TETRAPHENYLPORPHYRINRIN AND NICKEL BISDIPHENYLGLYOXIME HALIDES Ph.D. Thesis
Larry Frederick Mehne 1976 189 p
Avail: Univ. Microfilms Order No. 76-22743

The effects on the electronic structure of square planar complexes due to axial interactions with the central metal ion were studied for several cases. The complexes investigated included the series of M(DPG)2 compounds, where M = Ni, Pd, and Pt, and FeTPP. The axial perturbations of M(DPG)2 were due to oxidation and concomitant coordination in solution and to partial oxidation and concomitant metal-metal interaction in the solid state. The FeTPP was perturbed by complexation with carbon monoxide which was accompanied by a change in spin state. In addition the EPR of the cobaloxime, Co(DPG)2(py)2, was analyzed for the purpose of comparison with the isoelectronic Ni(DPG)2(py)2X. Dissert. Abstr.

N77-12891 Temple Univ., Philadelphia, Pa.
KONDO AND MAGNETIC ORDERING BEHAVIOR IN SINGLET GROUND STATE SYSTEMS Ph.D. Thesis
Aly Ibrahim Aly Muhammad Abou-Aly 1976 188 p
Avail: Univ. Microfilms Order No. 76-22074

The electrical resistivity of the singlet ground state system La(1 - x) PrxSn3 (x = 0 to 1) was measured between 1 and 300 K. A resistivity minimum was observed, followed by a maximum and abrupt drop at low temperature. In sufficiently dilute samples (x < .2), resistivity, magnetoresistance and magnetization measurements indicate that this resistance behavior is not attributable to magnetic ordering. An explanation in terms of inelastic scattering from the crystalline electric field-split ion levels is presented up to the second Born approximation. The observed resistive behavior of La(1 - x)PrxSn3 is strongly suggestive of Kondo scattering from the excited magnetic CEF levels, and the precipitative drop in resistivity is ascribable to the thermal deactivation of the excited CEF levels.Dissert. Abstr.

N77-12892 Arizona State Univ., Tempe.
THERMODYNAMIC, STRUCTURAL AND TRANSPORT PROPERTIES OF SOME FLUORITE SOLID ELECTROLYTES Ph.D. Thesis
Carl Eugene Derrington 1976 125 p
Avail: Univ. Microfilms Order No. 76-19439

The ionic conductivity above and below the melting temperature was measured for the fluorides, chlorides and bromides of calcium, strontium and barium and for magnesium chlorides and lead fluoride. The observed behavior is of three types: (1) there is an increase in conductivity of several order of magnitude on melting; (2) there is a solid-solid transition accompanied by a large increase in conductivity with little subsequent change on melting and; (3) the conductivity of the solid is continuous and changes only slightly on melting. The heat content of lead fluoride was measured and a correlation made between the observed thermodynamic behavior and its conductivity. High temperature X-ray measurements were made for strontium chloride, and a correlation is made between its structural and transport properties. Dissert. Abstr.

N77-12893# Lockheed Missiles and Space Co., Palo Alto, Calif.
EFFECTIVENESS OF HEAT-EMITTING COATINGS WITH VARIABLE DEGREE OF BLACKNESS
I. P. Gavrilova, G. N. Groshkova, and M. M. Koltun 1976 4 p refs Transl. into ENGLISH from Kosmich. Issled. Akad. Nauk SSSR (Moscow), v. 14, no. 1, 1976 p 156-158
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Ill. 60616

The production and application of heat emitting coatings whose emissivity would increase with the rise of temperature were investigated. Optical coatings, consisting of polished germanium plates with reflecting aluminum layer, and plates of single-crystalline indium antimonide doped by zinc were found suitable for this purpose. It was found that a temperature rise results in the appearance of a large number of excess free current carriers in the plates. The high coefficient of reflection, assured by the backing layers, starts to diminish and the emissivity grows abruptly. The developed coatings, or solar energy converters, are applicable to solar apparatus as they will diminish the absorption of earth's thermal radiation and protect solar panels and thermoelectrical generators from cooling. The efficiency of these coatings permits the maintainint of an equilibrium temperature on the surface of apparatus. I.M.

N77-12894# Stuttgart Univ. (West Germany). Sonderforschungsbereich 67.
STRUCTURAL DEFECTS IN SOLIDS Biennial Report, 1 Apr. 1974 - 1 Apr. 1976 [DEFEKSTRUKTUREN IN FESTEN STOFFEN]
A. Hammer, ed. Apr. 1976 187 p refs In GERMAN Original contains color illustrations
Avail: NTIS HC A09/MF A01

The research of the Special Research Group 67 (structure defects in solids) in the period 1974 to 1976 is presented. After a general presentation of the projects (management; crystal laboratory; obtaining low temperature; defects in organic molecule crystals; structural defects in heteropolar crystals; defects in semiconductors; and digital signal processing), each of the projects and its subprojects is discussed in detail. The review is completed with a list of publications and presentations. ESA

N77-12895# Illinois Univ., Urbana. Coordinated Science Lab.
MULTITARGET SPUTTERING USING DECOUPLED PLASMAS
C. E. Wickersham and J. E. Greene Apr. 1976 20 p refs
(Contract DAAB07-72-C-0259)
(AD-A025609; R-726; UILU-ENG-76-2214) Avail: NTIS HC A02/MF A01 CSCL 13/8

A model is derived for quantitatively predicting the chemical composition and thickness distributions of multielement films deposited by decoupled-plasma multitarget RF sputtering in which the substrates rotate at a variable rate through separate glow discharges. The model directly accounts for deposition variables such as target voltages, sputtering pressure, substrate rotation radius, rotation rate, and target-substrate separation distance. The effects of substrate heating and/or biasing are also considered. Predicted film thickness distributions were found to agree very well with experimental results in which beta back-scattering was used to measure the thickness of films deposited from InSb and GaSb targets on both stationary and rotating substrates. Using deposition parameters determined from the model presented in this paper, it is possible to grow single phase stoichiometric alloy films of any desired composition. In addition, intercalated films with layer thicknesses of less than 100 A and films which are chemically graded in the lateral and in-depth directions can be grown. Author (GRA)

N77-12896# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
TECHNOLOGY AND PHYSICS OF INFRARED AND POINT CONTACT DIODES Semiannual Technical Report, 1 May - 31 Oct. 1975
Ali Javan Mar. 1976 44 p refs
(Contract F19628-74-C-0812; ARPA Order 2618)
(AD-A025330; RADC-TR-76-94; SATR-3) Avail: NTIS HC A03/MF A01 CSCL 20/12

Background work for this contract, performed by this laboratory, has shown that tunneling characteristics of junctions formed by a very thin dielectric layer sandwiched between two metals is independent of frequency (from dc through

10 micrometers wave length). Principal work done this period was on the optical response of Al-Al2O3-Al junctions. These demonstrated characteristic photoemission response with considerable bolometric effect. An analysis of the data showed that the model is consistent with experimental results and correctly predicts behavior at lower frequencies. Work was done on Al-Al2O3-Pb junctions in the far infrared at liquid nitrogen and liquid helium temperatures; equipment difficulties precluded obtaining new information. Three talks were given and three articles submitted for publication during this period. GRA

N77-12897# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
[SEMICONDUCTORS UNDER HIGH PRESSURE] Final Report, 1 Sep. 1967 - 30 Jun. 1973
W. Paul Jan. 1976 41 p refs
(Contract N00014-67-A-0298-0012; NR Proj. 017-308)
(AD-A025323) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report gives a general description of research on the properties of semiconductors, particularly under conditions of pressure, carried out over a six-year period. It contains a complete bibliography of publications, a list of graduate students awarded the Ph.D degree, and abstracts of Technical Reports issued earlier. Author (GRA)

N77-12898# Lockheed Missiles and Space Co., Palo Alto, Calif.
HETEROGENEOUS NUCLEATION AND ITS INFLUENCE ON THE STRUCTURE OF THIN FILMS
G. M. Pound and H. Karge [1976] 14 p refs Transl. into ENGLISH from Basic Problems in Thin Film Physics, Proceedings of the Intern. Symp., Vandenhoeck and Ruprecht, Gottingen, 1966 p 19-28 Proceedings held at Clausthal-Gottingen, 6-11 Sep. 1965
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Illinois 60616

A survey is given of the theories that permit treatment of the relation between nc nucleation on heterogeneous substrates and the oriented growth of thin films. The importance of nucleation relative to epitaxy is discussed. Author

N77-12899# Lockheed Missiles and Space Co., Palo Alto, Calif.
CONTRIBUTION TO FRENKEL CONDENSATION THEORY
G. Zinsmeister [1976] 14 p refs Transl. into Engl. from Proceedings of an Intern. Symp., Vandenhoeck and Ruprecht, Gottingen, 1966 p 33-42 Presented to Basic Problems in Thin Films Intern. Symp., Clausthal-Gottingen, 6-11 Sep. 1965
Avail: NTIS HC A02/MF A01; National Translation Center, John Crerar Library, Chicago, Illinois 60616

A system of differential equations for the time change in the number of adsorbed atoms is given taking into account the formation (surface migration, direct deposition from the steam jet) and decomposition (dissociation, dissociation and evaporation of an atom, evaporation from twins, etc.) processes. Numerical considerations show that only surface migration need be taken into account for the formation of higher aggregates (twins, triplets, etc.), and decomposition processes of a higher aggregate play no part in a first approximation. Utilization of simplified equations yields the following result: No criterion exists for a sharply defined critical temperature of progressive condensation. The formation of a film of definite thickness occurs, however, within a relatively narrow temperature range for ordinary observation times. The condensation procedure is determined only by the magnitude of the adsorption energy of a single atom while the cohesion energy has no influence. Author

N77-12900# Sperry Univac, St. Paul, Minn. Defense Systems Div.
RELIABILITY EVALUATION MNOS ARRAYS Final Technical Report, Jun. 1974 - Sep. 1975
M. A. Horne May 1976 105 p refs
(Contract F30602-74-C-0237; AF Proj. 5519)
(AD-A025776; RADC-TR-76-128) Avail: NTIS
HC A06/MF A01 CSCL 09/2

The report describes the results of an investigation of MNOS device reliability. Two commercial device types were used as test vehicles in this study. Environmental and electrical stresses were used to accelerate failure and included high and low temperature operating life, high temperature storage, an 85C/85% relative humidity test and gamma radiation exposure. A wear out study was also performed. Nearly all the failures which did occur were attributable to processing flaws or failures usually associated with MOS technology in general. GRA

N77-12901# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH, 1975: 4 Quarterly Technical Summary Report, 1 Aug. - 31 Oct. 1975
Alan L. McWhorter 15 Nov. 1975 78 p refs
(Contract F19628-76-C-0002; AF Proj. 649L)
(AD-A025489; ESD-TR-75-313) Avail: NTIS
HC A05/MF A01 CSCL 20/12

The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Surface-Wave Technology. GRA

N77-12902# Oak Ridge National Lab., Tenn.
INVERSE MEAN FREE PATH, STOPPING POWER, CSDA RANGE, AND STRAGGLING IN SILICON AND SILICON DIOXIDE FOR ELECTRONS OF ENERGY LESS THAN OR EQUAL TO 10 keV
C. J. Tung, J. C. Ashley, V. E. Anderson, and R. H. Ritchie Apr. 1976 54 p refs
(DNA Proj. NWED-QAXTA040)
(AD-A025488; Scientific-2; RADC-TR-76-125) Avail: NTIS
HC A03/MF A01 CSCL 20/12

The interaction of electrons with the solids Si and SiO2 is described based on a 'modified electron gas model' for the valence band electrons in Si, a model insulator theory for the valence band electrons in SiO2, and inner shell ionization derived from atomic, generalized oscillator strengths. Contributions to the inverse mean fr path and stopping power from the various interaction proces es are tabulated for electron energies from threshold ((approximately equal) 4 eV above Fermi level) to 10 keV for Si and from 10 eV to 10 keV for SiO2. Electron range in the continuous slowing-down approximation and straggling are tabulated for electron energies from 10 eV to 10 keV for both materials. GRA

N77-12903# Utah Univ., Salt Lake City. Dept. of Physics.
TECHNIQUE DEVELOPMENT FOR COMPLETE ELECTRONIC-STRUCTURE CALCULATIONS IN CRYSTALLINE SOLIDS Final Report, 1 Nov. 1970 - 31 Oct. 1975
Frank E. Harris Mar. 1976 19 p refs
(Contract AF-AFOSR-1992-71; AF Proj. 9763; AF Proj. 6813)
(AD-A025128; AFOSR-76-0554TR) Avail: NTIS
HC A02/MF A01 CSCL 20/2

This is the final report of a five-year comprehensive effort in development of techniques for calculations of electronic structures of solids. This reports the method based on Fourier representation theory for exact Hartree-Fock calculation; gives results for atomic and molecular hydrogen crystals and lithium crystals; preliminary studies of correlation energy; and extension to surfaces or thin films and to polymers. GRA

N77-12904# Air Force Weapons Lab., Kirtland AFB, N.Mex.
A THEORETICAL STUDY OF THE PERMANENT AND TRANSIENT EFFECTS OF IONIZING RADIATION ON THE ELECTRICAL PERFORMANCE OF METAL OXIDE SEMICONDUCTOR ON SAPPHIRE INVERTERS Final Report
Robert J. Antinone and D. Howard Phillips Feb. 1976 143 p refs
(DNA Proj. NWED-QAXTD043)
(AD-A024752; AFWL-TR-74-264) Avail: NTIS
HC A07/MF A01 CSCL 09/3

The results of theoretical calculations on the electrical performance of p-channel metal oxide semiconductor/silicon on sapphire and complementary metal oxide semiconductor on sapphire inverters subjected to ionizing radiation are presented. Permanent changes are related to threshold voltage and, thus, are applicable to many fabrication technologies. Transient effects have been characterized for typical MOS/SOS photocurrents. For each inverter type the influence of threshold voltage and gain effects on normal DC operation, switching speed and noise margin are determined. The transient photocurrent effects on output voltage and noise margins are also presented. Every effort has been made to make the results generally applicable. Where that is not possible, specific inverters have been used to

illustrate results. A first order model based on the simplified Sah equations with fixed mobility and fixed capacitance has been used in these studies. Author (GRA)

N77-12905# Technion Research and Development Foundation Ltd., Haifa (Israel).

PROPERTIES OF ELECTRON GAS IN CONSTANT MAGNETIC AND ELECTRIC FIELDS Final Technical Report

J. Zak Oct. 1975 27 p refs

(Grant DA-ERO-75-G-061; DA Proj. 1T1-61102-B-11B)

(AD-A025464) Avail: NTIS HC A03/MF A01 CSCL 20/12

Significant progress was made in applying the kq-representation to the construction of localized states and effective Hamiltonians in perturbed crystals. The work started with the developing of a scheme for localized states on perfect lattices. Operators were defined that have as eigenvalues all the discrete vectors of the direct and reciprocal lattices in crystals. The construction of the localized states leads to a quantum mechanical description of the Bravais and the reciprocal lattices. The eigenfunctions of the lattice operators form a complete orthonomal set of localized functions in both the configuration and the Fourier space. In addition, these localized states clarify the structure of the kq-representation. On the fundamental side of the problem a close connection was established between a general set of localized states on a phase plane lattice and the well known von-Neumann coherent states. Localized states in the kq-representation were applied to band calculations and to the dynamics of electrons in perturbed crystals. In the band calculation problem a known variational principle satisfied by Wannier functions was extended to cover free electron-like solids. This extension makes the variational principle applicable to the whole range of solids, from tight binding to free electron-like solids. GRA

N77-12906# Office of Naval Research, London (England).

SUPERCONDUCTIVITY: A CHANGING R AND D SCENE IN GERMANY

R. A. Hein 12 May 1976 15 p

(AD-A025445; ONRL-R-4-76) Avail: NTIS HC A02/MF A01 CSCL 20/3

Most of the German research and development associated with superconductivity is centered at the Institut fuer Experimentale Kernphysik at the Kernforschungszentrum in Karlsruhe and at Siemens AG Research Laboratories in Erlangen with some basic physics and materials studies at various universities and institutes. This report discusses the present status of research and development in superconductivity and remarks on the history, personnel, and outlook of the various programs in these German installations. Author (GRA)

N77-12907# California Inst. of Tech., Pasadena.

HIGH VELOCITY BEHAVIOR OF DISLOCATIONS IN COPPER Final Report, 1 Oct. 1972 - 31 Mar. 1976

T. Vreeland, Jr. and David S. Wood 30 Apr. 1976 19 p refs

(Grants DA-ARO(D)-31-124-73-G47; DAHC04-75-G-0027)

(AD-A025484; ARO-11007.3-MC) Avail: NTIS HC A02/MF A01 CSCL 11/6

Dislocation velocity measurements were attempted using torsion pulses of 10 microsec duration to move dislocations at near-sonic velocities in copper single crystals. It was concluded that the torsion pulse technique was not applicable to the study of near sonic dislocation velocities in currently available test crystals. Efforts were then directed toward: (a) the growth of more perfect copper (with a considerably increased initial dislocation spacing), and (b) the development of a new loading system, designed to produce high amplitude stress pulses of shorter duration than obtainable with the torsion pulse technique (about 5 microsec). The new loading system employs a giant laser pulse, and is briefly described in this report. The crystal growth system developed for the production of highly perfect copper crystals is also described, together with the results obtained to date on the perfection of the crystals grown with the new system. GRA

N77-12908# Brandeis Univ., Waltham, Mass. Dept. of Physics.

POSITRON, ELECTRON AND PHOTON INTERACTION EXPERIMENTS Final Report, 1 Jan. 1973 - 31 Dec. 1975

Stephan Berko May 1976 9 p refs

(Grant DA-ARO(D)-31-124-73-G99)

(AD-A025482; ARO-11298.11-P) Avail: NTIS HC A02/MF A01 CSCL 20/12

The following were studied: (1) Momentum density measurements--Using the angular correlation of annihilation radiation, the momentum density and the Fermi surface of pure metals and disordered substitutional alloys has been studied and compared with theoretical predictions. The ordered alloys V3Si, V3Ge and V2O3 have also been studied. (2) Vacancy studies--Using angular correlation and positron lifetime techniques the behavior of positrons trapped at vacancy sites has been studied as a function of temperature, in order to measure vacancy activation energies in Pb and Pb alloys. (3) Slow positron interactions with solid surfaces--A high intensity slow positron beam facility has been constructed, and the interaction of approximately eV positrons with various solid surfaces has been studied. A large positronium production cross section has been observed and has been used to detect the excited states of positronium. GRA

N77-12909# Brown Univ., Providence, R. I. Dept. of Physics.

OPTICAL STUDIES OF BONDING IN SOLIDS Final Report, 1 Apr. 1973 - 31 Aug. 1974

Phillip J. Stiles and Jan Tauc 5 May 1976 9 p refs

(Grant DA-ARO(D)-31-124-73-G67)

(AD-A024949; ARO-10733.7-P) Avail: NTIS HC A02/MF A01 CSCL 20/12

Optical techniques were used to study the properties of solids, both bulk and at interfaces. Evidence indicates the importance of the chemical bond in determining primary optical properties, with the energy bands reflecting long-range order providing the major effect in some energy regions. Author (GRA)

N77-12910# Franklin Inst., Swarthmore, Pa. Bartol Research Foundation.

STUDY OF SEMICONDUCTOR SURFACES USING THE TECHNIQUE OF OPTICAL SECOND HARMONIC GENERATION Final Report, 2 Feb. 1970 - 20 Feb. 1976

Jar-Mo Chen and Chen-Show Wang 18 May 1976 10 p refs

(Grants DA-ARO(D)-31-124-73-G124; DA-ARO(D)-31-124-70-G44)

(AD-A024981; ARO-8906.17-P) Avail: NTIS HC A02/MF A01 CSCL 20/12

Optical Harmonic Generation is used to detect submonolayers of atoms on solid surfaces. It is shown that nonlinear optical method is much more sensitive than linear reflectance to the surface atoms. A nonlinear optical mixing spectroscopy should be able to detect most of the low lying excitations of a monolayer of atoms adsorbed on solid surfaces. CS of O2 coadsorption on metal and semiconductor surfaces has been studied in detail using LEED, Work function photoemission and Auger spectroscopy. Author (GRA)

N77-12911# RCA Solid State Technology Center, Somerville, N.J.

RELIABILITY EVALUATION OF C/MOS TECHNOLOGY IN COMPLEX INTEGRATED CIRCUITS Final Report, 8 May 1973 - 31 May 1975

C. Whelan Mar. 1976 232 p

(Contract F30602-73-C-0282; AF Proj. 5519)

(AD-A024918; RADC-TR-76-72) Avail: NTIS HC A11/MF A01 CSCL 09/5

The objective of the study was to investigate reliability of small and medium scale C/MOS integrated circuits. Four manufacturers type 4011 A Quad 2-input NAND Gates and three manufacturers type 4015 A dual four stage static shift registers were chosen as test vehicles. The study evaluated the effects of burn-ins and environmental stresses on the devices reliability. An evaluation was also made of the input protection networks, and a possible screen for input protection network was established. 993 gate devices and 148 shift register devices were tested. GRA

N77-12912# Ballistic Research Labs., Aberdeen Proving Ground, Md.

ABSORPTION OF ULTRASOUND IN ORGANIC CRYSTALS
Denis F. Strenzwilk and Peter D. Yedinak Apr. 1976 47 p refs
(DA Proj. 1T1-61102-A-148B)
(AD-A025174; BRL-1874) Avail: NTIS HC A03/MF A01 CSCL 19/1

In this paper an expression for the transition rate for a molecule in an organic crystal to absorb three phonons of lattice energy into the lowest frequency molecular vibrational mode (0 to 1 transition) is presented. The model is a three dimensional simple cubic lattice with nearest neighbor central and noncentral forces between molecules situated at the lattice sites. After making some approximations, the expression is compared with the transition rate determined from ultrasonic experiments on benzene, p-dichlorobenzene, carbon tetrachloride, and cyclohexane. The improvement that the expression offers over the transition rate derived by Liebermann and used by other investigators is discussed. GRA

N77-12913# Notre Dame Univ., Ind. Dept. of Metallurgical Engineering and Materials Science.
GROWTH OF SINGLE CRYSTALS OF SOME RARE-EARTH-COBALT COMPOUNDS R2Co17, FROM THE MELT
A. E. Miller and T. DSilva Dec. 1975 41 p
(Contract N00014-67-A-0242-0007)
(AD-A025141; TR-12/75) Avail: NTIS HC A03/MF A01 CSCL 20/2

Procedures are described that have been successfully used to grow large single crystals of rare-earth cobalt compounds, R2Co17. Author (GRA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N77-12914# European Space Agency, Paris (France).
A COMPUTER PROGRAM FOR THE CALCULATION OF RELATIVE EMISSION COEFFICIENTS OF DIATOMIC MOLECULES IN THE HIGH TEMPERATURE RANGE
Lutz Krauss, Horst Rittwagen et al May 1976 49 p refs Transl. into ENGLISH of 'Emissionskoeffizienten zweiatomiger Molekuele im Hochtemperaturbereich', DFVLR, Stuttgart Report DLR-Mitt-75-19, 23 Oct. 1975 Original report in GERMAN previously announced as N76-20949 Original German report available from DFVLR, Cologne DM 23,60
(ESA-TT-300; DLR-Mitt-75-19) Avail: NTIS HC A03/MF A01

The universal NASA computer program CEC 71 for calculating chemical equilibria was modified so that, in addition to the equilibium concentrations of existing components, their spectroscopic emission behavior can be calculated as a function of pressure and temperature. As the temperatures involved are frequently above the range of the polynomial description of the thermodynamic functions used in the original program, an extra section of program was inserted to calculate the thermodynamic functions directly from spectroscopic data. Author (ESA)

N77-12915# California Univ., Berkeley. Dept. of Mechanical Engineering.
ON THERMODYNAMICS AND THE NATURE OF THE SECOND LAW. 1: SINGLE PHASE CONTINUA
A. E. Green and P. M. Naghdi Apr. 1976 64 p refs
(Contract N00014-75-C-0148; NR Proj. 064-436)
(AD-A025109; AM-76-2) Avail: NTIS HC A04/MF A01 CSCL 20/13

The contents of this paper represent a new approach to continuum thermodynamics and are chiefly concerned with: (a) a procedure for obtaining restrictions on constitutive equations, (b) an appropriate mathematical statement of the second law and (c) the nature of restrictions placed by the latter on thermo-mechanical behavior of single phase continua. The point of departure is the introduction of a balance of calory (or entropy) and the use of the energy equation as an identity for all motions and all temperature distributions. This is in contrast to the approach adopted in most of the current literature on continuum thermodynamics based on the use of the Clausius-Duhem inequality. In order to gain some insight into the nature of the procedure, a study was made of an elastic material, which includes that of an ideal fluid as a special case, prior to the consideration of the second law. The existing statements of the second law or thermodynamic irreversibility are discussed along with a postulation of an inequality which reflects the fact that not all heat supplied to the body can be transformed into useful mechanical work. Since the latter inequality is stated for spatially homogeneous temperature fields, the restriction on the heat conduction vector is considered separately and is confined here to equilibrium cases in which heat flow is steady. The remainder of the paper deals mainly with the nature of thermodynamic restrictions on the thermo-mechanical response of a variety of deformable media, including elastic-plastic materials and simple materials with fading memory. GRA

N77-12916# National Bureau of Standards, Washington, D.C. Heat Div.
EQUILIBRIUM COMPOSITIONS AND COMPRESSIBILITY FACTORS FOR AIR IN THE TEMPERATURE RANGE 1500 TO 13000 KELVIN AND FOR DENSITIES FROM 0.000001 TO 1000 TIMES STANDARD DENSITY Final Report, Jul. 1974 - Jun. 1975
Max Klein Jun. 1976 77 p refs
(Contracts F40600-72-M-0002; AT(49-16)3003)
(AD-A025449; AEDC-TR-76-85) Avail: NTIS HC A05/MF A01 CSCL 20/13

A formalism for computing thermodynamic properties and equilibrium compositions of reacting gas mixtures at high densities is developed. This formalism makes use of the Haar-Shenker version of the augmented hard sphere equation of state. The formalism is used for computing compressibility factors and equilibrium compositions of air in the temperature range 2,000 K - 13,000 K for densities from that appropriate to air at standard conditions (0 C, 1 atmosphere) to densities 1,000 times as great. These tables are consistent with the earlier NBS tables which covered the range up to 100 times that density. Some interesting features of the dependence of composition on density are discussed. Author (GRA)

N77-12917# Center for Naval Analyses, Arlington, Va.
ON THE SEMI-CLASSICAL EXPANSION IN QUANTUM MECHANICS FOR ARBITRARY HAMILTONIANS
Maurice M. Mizrahi May 1976 34 p refs
(AD-A025441; CNA-Paper-154) Avail: NTIS HC A03/MF A01 CSCL 20/10

The purpose of this paper is to extend to a very wide class of Hamiltonians the range of validity of a well-known and oft-used expression for the semi-classical (WKB) approximation to the quantum-mechanical propagator K((q sub b),(t sub b);(q sub a),(t sub a)) identically equal to ((q sub a),(t sub b)/(q sub a),(t sub a)), or probability amplitude that a particle at (q sub a) at time (t sub a) will arrive at (q sub b) at time (t sub b). GRA

N77-12918# Center for Naval Analyses, Arlington, Va.
WKB EXPANSIONS BY PATH INTEGRALS, WITH APPLICATIONS TO THE ANHARMONIC OSCILLATOR
Maurice M. Mizrahi May 1976 80 p refs
(AD-A025440; CNA-Professional-Paper-153) Avail: NTIS HC A05/MF A01 CSCL 20/10

The author investigates the new approach to path integrals in quantum mechanics recently introduced by C. DeWitt-Morette, which has the advantage of not resting on the usual limiting process. It defines the suitable measures on the infinite-dimensional function spaces by their Fourier transforms, which are simple, closed-form expressions. GRA

N77-12919# Pennsylvania State Univ., University Park. Applied Research Lab.
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE THERMODYNAMIC PROPERTIES OF SULFUR HEXAFLUORIDE IN THE LIQUID PHASE Ph.D. Thesis
Bahram Keramati 29 Oct. 1975 135 p refs

(Contract N00017-73-C-1418)
(AD-A024986; TM-75-284) Avail: NTIS HC A07/MF A01 CSCL 20/13

The Density of liquid sulfur hexafluoride (SF6) was measured from 0 to 50 C at 5 degree intervals, at pressures ranging from saturation to 170 bar. A unique density float which operates on the principle of buoyancy was used for the measurements. Enthalpy, entropy and isothermal compressibility were then calculated from the experimental data and presented in a table. The statistical thermodynamic perturbation theory of Weeks, Chandler and Andersen was modified to improve the theoretical predictions at low densities. The modification involves the explicit accounting of the effects of the attractive part of the intermolecular potential on the pair correlation function. Comparison of the theory with the experimentally calculated configurational free energy and internal energy suggests that the Lennard-Jones 28,7 potential is more representative of the interaction of SF6 molecules than the Lennard-Jones 12,6. Author (GRA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N77-12920# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
RESEARCH AND DEVELOPMENT MANAGEMENT ANALYSIS SYSTEM (RDMAS) Final Report, 1973 - 1976
Stephen F. Rutz Apr. 1976 125 p
(AD-A025447; WES-Instruction-S-76-1) Avail: NTIS HC A06/MF A01 CSCL 05/1

This report describes a Research and Development Management Analysis Systems (RDMAS), developed and implemented in the Soils and Pavements Lab. of this Station (WES) during the period 1973-1976 as an extension of the WES Management Information System to provide closer control of the assigned research projects. The RDMAS provides a system of management tools and techniques for formulating research programs, initiating new research projects, determining the resources required/available to accomplish the effort, assessing the relative priority of competing items, evaluating technical productivity versus expenditure of funds, and monitoring participating elements on a continuous basis throughout the effort life. The report describes the general logic flow of the RDMAS in the basic text with details discussed in five instructional appendixes. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N77-12921 Polytechnic Inst. of New York.
SPARCOM: A SPARSE MATRIX ASSOCIATIVE RELATIONAL APPROACH TO DYNAMIC DATA STRUCTURING AND DATA RETRIEVAL Ph.D. Thesis
Ron Ashany 1976 257 p
Avail: Univ. Microfilms Order No. 76-23391

SPARCOM (Sparse Associative Relational Connection Matrix) is a method that was developed for the analysis, interpretation, organization, classification, update, and structure of stored data as well as for the search and retrieval of information from large data base (LDB) systems. The major problem investigated is the dynamic structuring of the data to meet the specifications of modern LDB systems for short response time and high throughput as illustrated by the requirements of several applications in a crime combating environment. Searching the data files concurrently by many queries in which many properties are specified, discovering information patterns from large amounts of data, determining the most distinctive properties of criminals, human-face identification, bullets' signature classification, inference of relationships, etc., are some of these requirements.
Dissert. Abstr.

N77-12922 National Lending Library for Science and Technology, Boston Spa (England).
PROTECTION OF INFORMATION WHEN USING MICROFILM
Ye. P. Ryzhikh and L. P. Shchipanova [1975] 10 p refs Transl. into ENGLISH from Vses. Nauch.-Issled. Inst. Gidromet. Inf., Mirov. Tsentr. Danny (Moscow), T. Vyp. 4, 1975 p 11-14 (NLL-M-24128-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

An error detecting and correcting system was developed with the aim of increasing the operational reliability of the microfilm library. The EDCS works by means of computer programs using iterated codes. Before being written onto the microfilm the set of significant information corresponding to the film zone is read from magnetic tape into the computer MOZU where coding is performed in the memory before the zone is recorded on microfilm. The operational time for a program depends on the length of the SSI and on the number of errors in the set of significant information. I.M.

N77-12923 National Lending Library for Science and Technology, Boston Spa (England).
LAY-OUT OF INFORMATION OF MICROFILM
Ye. P. Ryzhikh and M. Z. Shaymardanov [1975] 7 p refs Transl. into ENGLISH from Vses. Nauch.-Issled. Inst. Gidromet. Inf., Mirov. Tsentr. Danny (Moscow), T. Vyp. 4, 1975 p 8-10 (NLL-M-24127-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Informations, transcribed from punched cards onto microfilms using a Minsk-22 computer, are divided into three categories: significant, supplementary and auxiliary. The significant information, consisting of 36-character words, is described on the master card. A film is defined as an aggregate of zones carrying an integral number of entries. Supplementary information that carries out quick searches for the necessary significant information comprises the film catalogue, surplus and test information, and information written in the zero word of zone. The auxiliary information consists of special marks for the zone numbers and performs a control function when information is read in from microfilm. All information stored on microfilms is first transcribed onto magnetic tapes. I.M.

N77-12924 National Lending Library for Science and Technology, Boston Spa (England).
RECOGNITION OF CODED SYMBOLS ON READING OUT DATA
A. S. Lushtak [1975] 21 p refs Transl. into ENGLISH from Moscow Vses. Nauch.-Issled. Inst. Gidromet. Inf.-Mirov. Tsentr. Danny, T. Vyp. (Moscow), vol. 4, 1975 p 36-44 In ENGLISH and RUSSIAN
(NLL-M-24126-(5828.4F))

The complexity of the problem of coded symbol recognition lies in the fact that rigorous functional relationship exists between the signals and the symbols previously recorded on the medium. The problem is statistical in nature and is analogous to the reception of discrete messages in a communication line. The criteria and methods developed in the theory of transmission of messages by communication channel are adopted to derive a solution for the readout symbol. Author

N77-12925*# National Aeronautics and Space Administration, Washington, D.C.
RESEARCH AND TECHNOLOGY OBJECTIVES AND PLANS. A SUMMARY, FY 1977 RESEARCH AND TECHNOLOGY PROGRAM.

1976 199 p
(NASA-TM-X-74296) Avail: NTIS HC $4.75 CSCL 05B

A compilation of the summary portion of each of the Research and Technology Operating Plans (RTOP) used for management review and control of research currently in progress throughout NASA is presented along with citations and abstracts of the RTOPs. Four indexes are included: (1) subject; (2) technical monitor; (3) responsible NASA organization; and (4) RTOP number. Author

N77-12926# Stanford Research Inst., Menlo Park, Calif.
AN INITIAL STUDY OF CURRENT AND PROJECTED PUBLISHING TECHNOLOGY PERTINENT TO THE NAVY TECHNICAL MANUAL SYSTEM (NTMS) Final Report
Jack J. Bialik, Thomas L. Humphrey, Patricia Whiting-OKeefe, and Raymond Zablocki Mar. 1976 131 p refs
(Contract N00014-76-C-0407; SRI Proj. 4739)
(AD-A025744) Avail: NTIS HC A07/MF A01 CSCL 14/5

The U.S. Navy has begun a program to develop an integrated, automated system to prepare, produce, distribute, and update Navy Technical Manuals (TMs). This program, called the Navy Technical Manual System (NTMS), will probably require at least three years to bring to the initial operating phase. It is therefore important to consider technology trends when committing to the design of the system. For this contract, SRI interviewed 30 companies and five newspaper corporations that are users and/or suppliers of automation technology in the printing and publishing fields. Each source contacted was questioned about experience with the use of the equipment, intended plans for use of new or additional equipment, and/or plans to introduce new products into the marketplace in the next two to three years. This report contains the results of the interviews together with an analysis of the information obtained from the interviews. The analysis is directed toward the particular problems that will face the NTMS when it is in operation. GRA

N77-12927# King Research, Inc., Rockville, Md. Center for Quantitative Sciences.
STATISTICAL INDICATORS OF SCIENTIFIC AND TECHNICAL COMMUNICATION (1960-1980). VOLUME 3: A DATA APPENDIX TO VOLUME 2 Final Report
D. W. King, D. D. McDonald, and N. K. Roderer May 1976 315 p
(Contract NSF C-878)
(PB-255503/5; KRI-9212-III-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 05B

Data from a longitudinal study of 191 journals published between 1962 and 1974 are analyzed. Tables show characteristics of these journals, such as number of issues, number of articles, number of pages, number of characters per page and bibliographic citations. The work is presented as a data reference tool to other researchers involved in the study of the scientific and technical journal literature. GRA

N77-12928# Defense Supply Agency, Alexandria, Va.
SCIENTIFIC AND TECHNICAL INFORMATION NEEDS OF USERS OR POTENTIAL USERS OF THE DSA-ADMINISTERED, DoD INFORMATION ANALYSIS CENTERS Final Report
Michael C. Corridore Apr. 1976 193 p refs
(AD-A024937) Avail: NTIS HC A09/MF A01 CSCL 05/2

Two separate but related survey efforts were conducted. The first effort was aimed at determining the level of satisfaction of DoD Research and Development activities with the DSA-administered DoD Information Analysis Centers (IACS). The second survey effort attempted to identify specific, job-related scientific and technical information needs of Defense scientists and engineers which could be incorporated into the DSA-administered DoD IACS Five-Year plan as a set of long-range, technical objectives for the IACS to achieve. Principal findings from this effort included the following: (1) three of every four Defense scientists and engineers experience problems in locating, obtaining, and using scientific and technical information, (2) the most important products or services that can be produced or offered by the IACS are handbooks, and databooks (3) DoD scientists and engineers engaged in R and D activities expressed a need for scientific and technical information in over thirty-five different areas including various lasers and masers, optical materials and properties, electron beam welding, eddy current techniques to measure residual stress in steel, etc. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N77-12929# RAND Corp., Santa Monica, Calif.
A COMPUTER MODEL FOR ESTIMATING DEVELOPMENT AND PROCUREMENT COSTS OF AIRCRAFT DAPCA-III Interim Report
H. E. Boren, Jr. Mar. 1976 93 p refs Supersedes R-761-PR-abridged
(Contract F44620-73-C-0011)
(AD-A025276; R-1854-PR) Avail: NTIS HC A05/MF A01 CSCL 01/3

The report describes and lists an updated computer model (DAPCA-III) that computes from parametric relationships the development and procurement costs of two major flyaway subsystems of an aircraft--airframes and engines. Avionics costs are included but are treated as throughputs. Cumulative average, unit, and total flyaway costs are obtained for up to ten specified aircraft production quantities. Flight and avionics procurements are allowed. Although costs of spare engines are not considered to be flyaway costs, they are calculated in the model as additional costs not included in the totals. Unless otherwise specified, all costs are calculated in 1975 dollars. GRA

N77-12930# Federal Energy Administration, Washington, D.C. Office of Policy and Analysis.
ECONOMICS OF DEPLETABLE RESOURCES: MARKET FORCES AND INTERTEMPORAL BIAS
James L. Sweeney 30 Jun. 1976 52 p refs
(PB-255623/1; FEA/B-76/028) Avail: NTIS HC A04/MF A01 CSCL 05C

Optimal and market determined extraction patterns for a depletable resource available (at a cost) from many reserves of various grades are examined. Under a general set of conditions optimal allocations of a depletable resource can be supported by a purely competitive market. The concept of a time-varying market imperfection function is introduced to determine whether specific market form will overextract or underextract the resource (in comparison to a competitive allocation). The intertemporal biases associated with depletion allowances, monopolies, externalities, vulnerability costs, and price regulations are analyzed. GRA

N77-12931# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
THE APPLICATION OF DESIGN-TO-COST ACQUISITION POLICIES TO SELECTED ELECTRONICS SUBSYSTEM DEVELOPMENT PROGRAMS Final Report, May 1974 - May 1975
C. David Weimer Jun. 1975 185 p refs
(Contract DAHC15-73-C-0200)
(AD-A024895; S-459; IDA/HQ-75-17527) Avail: NTIS HC A09/MF A01 CSCL 14/1

This report presents findings and conclusions resulting from a one-year study to observe, record, and analyze the Department of Defense (DOD) experience in applying Design-to-Cost (DTC) acquisition policies to electronics subsystems. Eleven DTC subsystems and three non-DTC subsystems, representing all three major Services and involving 27 industrial contractors, were investigated. Guidelines for future policy development resulting from the findings were recommended in the areas of DTC subsystem program planning, prediction of production costs and equipment performance, reliability improvement warranties, and subsystem management. These recommendations emphasized the importance of planning for DTC early in the development process and providing development time and funds, as necessary, to achieve production or life-cycle cost goals. Recommendations were also focused upon improving the production cost and performance estimating process, identifying risk areas for

application of reliability improvement warranties, managing key subcontractors and vendors, and continuing analytic effects to derive DTC 'lessons learned' at the subsystem level. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N77-12932# National Archives and Records Service, Washington, D.C.
CODE OF FEDERAL REGULATIONS. 14. AERONAUTICS AND SPACE, PARTS 1 TO 59
1 Jan. 1976 740 p refs Revised
Avail: NTIS MF A01; SOD HC $5.30

Federal aviation procedural rules and standards for certification in some of the following areas are presented: (1) air products, (2) aircraft parts, (3) pilots, and (4) flight instructors. Other areas reported include operating rules for (1) air traffic, (2) airport traffic patterns and (3) airport security. B.B.

N77-12933# National Archives and Records Service, Washington, D.C.
CODE OF FEDERAL REGULATIONS. 14. AERONAUTICS AND SPACE, PARTS 60 TO 199
1 Jan. 1976 786 p refs Revised
Avail: NTIS MF A01; SOD HC $5.60
For abstract, see N77-12932.

N77-12934# National Archives and Records Service, Washington, D.C.
CODE OF FEDERAL REGULATIONS. 14. AERONAUTICS AND SPACE, PARTS 200 TO 1199
1 Jan. 1976 742 p refs Revised
Avail: NTIS MF A01; SOD HC $6.20

Economic, procedural, and special regulations for the Civil Aeronautics Board are presented along with statements of general policy. B.B.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N77-12935*# Stanford Univ., Calif. School of Medicine.
BIOMEDICAL TECHNICAL TRANSFER. APPLICATIONS OF NASA SCIENCE AND TECHNOLOGY Annual Report, Oct. 1975 - Sep. 1976
Sep. 1976 57 p refs
(Grant NGR-05-020-634)
(NASA-CR-149161) Avail: NTIS HC A04/MF A01 CSCL 06B

Lower body negative pressure testing in cardiac patients has been completed as well as the design and construction of a new leg negative unit for evaluating heart patients. This technology is based on NASA research, using vacuum chambers to stress the cardiovascular system during space flight. Additional laboratory tests of an intracranial pressure transducer, have been conducted. Three new biomedical problems to which NASA technology is applicable are also identified. These are: a communication device for the speech impaired, the NASA development liquid-cooled garment, and miniature force transducers for heart research. Author

N77-12936# National Swedish Inst. for Building Research, Stockholm.
ECONOMIC EVALUATION METHODS IN COMMUNITY PLANNING
Per Ahren Jan. 1976 112 p refs
(PB-253432/9; D2:1976; ISBN-91-540-2540-0) Avail: NTIS HC $5.50 CSCL 13B

Various methods of assessing in economic terms the future results of municipal planning are analyzed. Characteristic features of city planning, types of plans and planning situations are discussed. Societal economics of built-up areas are investigated from the viewpoint of the user's premise of values, in contrast to that of the decision-maker. Negative and positive effects of plans are given in monetary terms. Author (GRA)

N77-12937# Miami Valley Regional Planning Commission, Dayton, Ohio.
FINANCIAL CRITICAL FACTORS ANALYSIS Final Report
Mar. 1976 64 p refs Prepared by Linton and Co., Inc.
(Grant EPA-P-005160-01)
(PB-254377/5; EPA-208-MVRPC-M6) Avail: NTIS HC A04/MF A01 CSCL 13B

State constitutional and statutory methods available to various types of Ohio governmental units for the financing of waste treatment facilities are described. The circumstances necessary for financing through state agencies or with federal funds are identified. Ten local governmental financing experiences are related. The information is used in the development of alternatives for the financing of structural waste treatment facilities in the areawide waste treatment management plan. GRA

N77-12938# Kentucky Water Resources Research Inst., Lexington.
HYDRODYNAMIC SEPARATION OF SOLIDS FROM SOLID-LIQUID MIXTURES Research Report
Harry J. Sterling, Jr. and Don J. Wood 1976 214 p refs
(Contracts DI-14-31-0001-4017; DI-14-31-0001-5017)
(PB-254490/6; RR-94; W76-09716; OWRT-A-048-KY(1))
Avail: NTIS HC A10/MF A01 CSCL 13B

Several schemes for separating solid pollutants from water flowing in a closed conduit were examined. Separation based on the momentum differential between the solids and liquids and the centrifugal movement of a conveying liquid were both examined under turbulent flow conditions. Utilization of the differential momentum of solid particles and water when flowing laminarly through a pipe was found to be a viable separation scheme. The experimental situation was modeled theoretically using particles approaching a sink located in a uniform stream. GRA

N77-12939# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: REGIONAL AQUIFER EVALUATION STUDIES WITH STOCHASTIC INPUTS Partial Completion Report, Sep. 1971 - Aug. 1975
Chenchayya T. Bathala, J. A. Spooner, and A. Ramachandra Rao Feb. 1976 90 p refs
(Contract DI-14-21-0001-TR-72)
(PB-256564/6; W76-11176; OWRT-C-3277(3713)(11)) Avail: NTIS HC A05/MF A01 CSCL 13B

A deterministic digital model is developed representing glacial aquifers to assist water resource planners of medium size urban communities. The glacial aquifer selected as the test site was that underlying the Greater Lafayette, Indiana area. The digital model was formulated by using the finite difference method. Initial estimates of recharge from ponds and base flow into stream were obtained from a flow net analysis. Cross correlations and time lags between rainfall, river stages and groundwater levels were examined to introduce net recharge due to rainfall into the model and to establish the hydraulic interaction between the rivers and the aquifer. GRA

N77-12940# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES PHASE 1 Final Report
J. W. Delleur, J. M. Bell, L. Z. Breen, W. N. Melhorn, and W. L. Miller Apr. 1976 80 p
(Contract DI-14-31-0001-3713)

(PB-256565/3; W76-11175; OWRT-C-3277(3713)(12)) Avail: NTIS HC A05/MF A01 CSCL 13B

The interdisciplinary study for planning urban water resources development gives modes for estimating population growth, water demand, quantity and quality of surface runoff, and availability of ground water for communities in the 100,000 to 200,000 population range. These models were extended for a 25 to 30 year period. The test area was principally the Lafayette and West Lafayette, Indiana area. Additional sites in Indiana, Oklahoma, and Illinois were used for specific purposes. Life tables were developed for the area and a regression equation proposed which relates water consumption to size and value of houses, rental values and population age distribution. .GRA

N77-12941# Purdue Univ., Lafayette, Ind. Water Resources Research Center.

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: POPULATION CHARACTERISTICS AND RESIDENTIAL WATER USE

Harry R. Potter, Edward R. Cooper, and Leonard Z. Breen May 1976 42 p refs

(Contract DI-14-31-0001-3713)

(PB-256566/1; W76-11177; OWRT-C-3277(3713)(13)) Avail: NTIS HC A03/MF A01 CSCL 13B

In the Lafayette-West Lafayette, Indiana area, there were substantial differences in the quantity of water used by different residences and these differences were shown to be related to socioeconomic and demographic characteristics. These relationships, in combination with population projections, can be used for predicting future water demand. The use of tracts and blocks were compared in the study. In the analyses high income tracts had per capita water consumption rates about 3 times that of the low income. Positive relationships were found between water use and housing value, median number of rooms, percent of families in single dwellings, percent of high school graduates and percent of white collar workers. GRA

N77-12942# Little (Arthur D.), Inc., Cambridge, Mass.

TELECOMMUNICATIONS AND SOCIETY, 1976-1991: REPORT TO OFFICE OF TELECOMMUNICATIONS POLICY EXECUTIVE OFFICE OF THE PRESIDENT

22 Jun. 1976 153 p

(Contract TP-6AC017)

(PB-256829/3; ADL-C-79119) Avail: NTIS HC A08/MF A01 CSCL 17B

A set of five scenarios illustrating some of the impacts, conflicts, issues, and changes that might arise during the next 15 years from the interaction between technological innovation in telecommunications and the social context in which it occurs is provided. This context includes the national economy, political framework, industrial structure, international relations, and personal life styles. GRA

N77-12943# State Univ. of New York, Syracuse.

MARINE WASTE DISPOSAL IN THE NEW YORK BIGHT: PUBLIC POLICY, ENVIRONMENTAL IMPACTS AND ALTERNATIVE FUTURES M.S. Thesis

Michael L. Italiano Mar. 1976 299 p refs

(PB-255222/2; MLI-76/1) Avail: NTIS HC A13/MF A01 CSCL 13B

The development of public policy related to waste disposal is discussed. Scientific knowledge of the effects of waste disposal on marine ecology is preliminary and incomplete. Disposal has changed the characteristics of the sludge and dredge spoil sites. The trend of submarine sludge and dredge spoil movement is correlated with currents, heavy metal organic matter and coliform bacteria distribution. Alternative methods of disposal are explored. GRA

N77-12944# Mississippi State Univ., Mississippi State. Water Resources Research Inst.

AN EVALUATION OF PUBLIC HEARINGS ON WATER DEVELOPMENT PROJECTS IN MISSISSIPPI

Gary D. Hampe Jul. 1976 87 p refs Sponsored by Dept. of Interior

(PB-256583/6; W76-11337; OWRT-A-091-MISS(1)) Avail: NTIS HC A05/MF A01 CSCL 13B

Research findings from three modes of investigation relating to public participation in public meetings held by the Corps of Engineers during the period 1962-1975 showed similar results. Most participants supported the projects proposed by the Corps. Participants were on the average of a higher social class than the general population. The main conclusion to be drawn from this research was that the Corps has responded to its public in the past and continues to do so at present. Younger participants in the public hearing process are beginning to bring into focus more opposition than has existed in the past. GRA

N77-12945# Mitre Corp., McLean, Va.

DATA BASE DESIGN FOR DEMAND-RESPONSIVE TRANSIT

Virgil S. Thurlow and Sam Winchester Jul. 1976 93 p

(Contract DOT-UT-50016)

(PB-256820/2; MTR-7254; UMTA-VA-06-0024-76-2) Avail: NTIS HC A05/MF A01 CSCL 13B

A data base for demand-responsive transit operations was designed to provide for systematic reporting and to be a standard of comparison between transit operations. The data base design is presented in the form of data sheets that may be used directly for recording information about transit operations. Subjects included in the data base include urban characteristics, ridership, costs, and services. Steps necessary for the complete development of a data base include design tests, analytical validity, design revision, and development of reporting procedures and maintenance. This manual data base system is structured so that it may be automated at a future time. GRA

N77-12946# Aerospace Corp., El Segundo, Calif.

PERSONAL RAPID TRANSIT RESEARCH CONDUCTED AT THE AEROSPACE CORPORATION

C. L. Olson and H. Bernstein Jun. 1976 295 p refs

(Contract DOT-UT-60006)

(PB-256846/7; UMTA-CA-06-0071-76-1) Avail: NTIS HC A13/MF A01 CSCL 13F

Research conducted on the conceptual and experimental development of Personal Rapid Transit (PRT) during the period from 1968 to 1975 is summarized. The work considered not only the technical and operational aspects of the PRT concept, but also included estimates of PRT capital and operating costs, analyses of system safety and reliability, analyses of urban applications and associated economics, evaluation of PRT energy utilization, development of PRT planning methodologies, and assessments of PRT deployment impacts. Technology shortfalls associated with the possible future implementation of the specific PRT concept are identified, and research and development activities to overcome these shortfalls are recommended. GRA

N77-12947# North Central Texas Council of Governments, Arlington.

OUR NATURAL RESOURCES: WHAT IS OUR WATER WORTH. 1975 - 1978 WATER QUALITY MANAGEMENT PLANNING PROGRAM, NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

Jun. 1976 118 p Sponsored by EPA

(PB-256976/2; NCTCOG/WR-76/01) Avail: NTIS HC A06/MF A01 CSCL 13B

The continuing planning process to date, the anticipated content of the annual plans, detailed NCTCOG staff work activities, each anticipated consultant contract, and the resources being devoted to the program are described. Integration of functional planning efforts at NCTCOG is being addressed primarily through the formulation and adoption of a preferred regional development policy. GRA

N77-12948# Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.

THE COST OF MUNICIPAL WATER SUPPLY: A CASE STUDY

Robert M. Clark, Richard Stevie, and Greg Trygg Jul. 1976 45 p refs

(PB-255960/7; EPA-600/2-76-179) Avail: NTIS HC A03/MF A01 CSCL 13B

Problems related to water supply have become increasingly important in recent years. Spreading urban boundaries force many potential water supply customers to locate farther and farther

away from available water sources, thereby increasing the costs which must be incurred in order to provide adequate service. Therefore, it is important to systematically and objectively study the factors which affect the costs of water supply management. The Cincinnati Water Works of Cincinnati, Ohio is presented for a case study to examine these factors and to document the application of a functional approach to the analysis of water supply costs. GRA

N77-12949# Swedish Council for Building Research, Stockholm.
URBAN AND REGIONAL RESEARCH IN SWEDEN 1974-1975. AN ANNOTATED LIST
1976 86 p
(PB-256201/5; ISBN-91-540-2557-5) Avail: NTIS HC A05/MF A01 CSCL 13B

A list of urban and regional projects in progress, started or completed in Sweden over the period 1974-1975 is presented. It has been compiled in accordance with a recommendation approved by the United National Economic Commission for Europe (Committee for Housing Building and Planning), Group of Experts on Urban and Regional Research. The material has been collected by the Swedish Council for Building Research (BFR), which is Sweden's focal point for international co-operation in this field. GRA

N77-12950# North Carolina Univ., Chapel Hill. Highway Safety Research Center.
IMPLEMENTATION OF PROVEN TECHNOLOGY IN MAKING THE HIGHWAY ENVIRONMENT SAFE Final Report
Forrest M. Council and William W. Hunter Aug. 1975 260 p refs Sponsored by Dept. of Transportation
(PB-256664; MVMA-UNC-74-16) Avail: NTIS HC A12/MF A01 CSCL 13B

Four primary tasks are included. First, a thorough search of the literature was conducted in the area of highway design to form a candidate list of programs. The second task was the creation of a priority ranking of cost-effective programs. The third task was concerned with a determination of problems that present road blocks to information dissemination. In the fourth task, a comprehensive list of problem areas was developed, and proposed strategies formulated to overcome these problems. GRA

N77-12951# Southern California Association of Governments, Los Angeles Criminal Justice Planning Dept.
TRANSIT SAFETY AND SECURITY: A DESIGN FRAMEWORK Final Report, Apr. 1976
Apr. 1976 170 p refs
(PB-256518/2) Avail: NTIS HC A08/MF A01 CSCL 13B

The following subjects are included: (1) development of security and safety objectives in the operation of major transit systems; (2) assessment of crime patterns and safety problems for selected regional transit corridors; (3) examination of the effectiveness of crime prevention by physical design of transit facilities; and (4) development of a reference document for safety and security design criteria in transit facilities. Some specific design areas examined include the following: park-and-ride facilities, parking structures; site planning and landscaping; illumination levels; passenger boarding safety; subway and elevated systems; station visibility; closure and monitoring; traffic and parking criteria; and the special needs of the elderly and handicapped. GRA

N77-12952# Tri-State Regional Planning Commission, New York.
URBAN DENSITIES FOR PUBLIC TRANSPORTATION Final Report
Boris S. Pushkarev and Jeffrey M. Zupan May 1976 318 p refs
(PB-256636/2; UMTA-IT-09-0023-76-1) Avail: NTIS HC A14/MF A01 CSCL 13B

The suitability of different urban density arrangements to eight modes of public transportation is studied. These modes are: the taxicab, dial-a-bus, local bus, express bus, light rail, light guideway transit, rapid transit and commuter rail. Differences in transit ridership among urban areas are largely explained by areawide density, downtown size measured in nonresidential floorspace and the existence of rail transit. Operating and capital costs of the eight modes are examined. At any particular residential density the demand level varies depending on the area's distance from a non-resident concentration, and on the size and character of that concentration. GRA

N77-12953# Department of Transportation, Washington, D.C. Office of R and D Policy.
AN OVERVIEW OF FEDERAL TECHNOLOGY TRANSFER Final Report
Alfonso, B. Linhares Jun. 1976 30 p refs Presented at 1st Ann. Meeting of the Technol. Transfer Soc., Los Angeles, 25 Jun. 1976
(PB-255693/4; DOT-TST-76T-1) Avail: NTIS HC A03/MF A01 CSCL 05A

Federal technology transfer consists of those processes whereby research knowledge is transferred operationally into useful processes, products or programs that fulfill actual or potential public or private needs. These interests can be either vertical (from one government or industry level to another) or horizontal (from one functional area to another). To achieve effective transfer of technology into public sector areas frequently involves participation of both general purpose and functional governmental agencies. Several factors contribute to effective R&D application: awareness of user needs, user technical sophistication, supplier technical sophistication, reduction of risk aversion tendencies, market aggregation, and program coordination. A number of mechanisms are available to accomplish this, including direct assistance, tailored documents, training, demonstrations, etc. Author (GRA)

88 SPACE SCIENCES (GENERAL)

N77-12954*# Little (Arthur D.), Inc., Cambridge, Mass.
FLOAT-ZONE PROCESSING IN A WEIGHTLESS ENVIRONMENT
A. A. Fowle, J. S. Haggerty, R. R. Perron, P. F. Strong, and J. L. Swanson Washington NASA Nov. 1976 81 p refs
(Contract NAS8-29877)
(NASA-CR-2768; M-190) Avail: NTIS HC A05/MF A01 CSCL 20L

The results were reported of investigations to: (1) test the validity of analyses which set maximum practical diameters for Si crystals that can be processed by the float zone method in a near weightless environment, (2) determine the convective flow patterns induced in a typical float zone, Si melt under conditions perceived to be advantageous to the crystal growth process using flow visualization techniques applied to a dimensionally scaled model of the Si melt, (3) revise the estimates of the economic impact of space produced Si crystal by the float zone method on the U.S. electronics industry, and (4) devise a rational plan for future work related to crystal growth phenomena wherein low gravity conditions available in a space site can be used to maximum benefit to the U.S. electronics industry. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N77-12955*# Scientific Translation Service, Santa Barbara, Calif.
OPTIMIZATION IN THE STUDY OF A SINUSOIDAL WAVEFORM OF KNOWN PERIODICITY IN THE PRESENCE OF NOISE. APPLICATION IN RADIO ASTRONOMY, 1
Marc Vinokur Washington NASA Oct. 1976 81 p refs Transl. into ENGLISH from Ann. d'Astronomie (France), v. 28, no. 2, 1965 p 412-445
(Contract NASw-2791)
(NASA-TT-F-16764) Avail: NTIS HC A05/MF A01 CSCL 03A

In connection with the problems involved in the optimum utilization of information, the following deals with the measurement, in the presence of noise, of the amplitude and phase of

a sinusoid who period is known. The aim is twofold: first, to achieve as good a precision as the signal to noise ratio and the observing time permit, and secondly, to attain such a precision with the minimum number of points measured with the minimum accuracy. The following approaches are treated: least mean square curve fitting, optimization of the physical filter, convolution by a sinusoid having the same period as the signal, summation, Fourier series analysis. These methods, singly or suitably combined, lead to the same results, and the probability distribution functions of the amplitude and phase thus obtained are established. The effects of sampling and quantization on the final signal to noise ratio are then studied as a function of the characteristics of the filter preceding the recorder; several results are established or reproduced, and then applied to the case where filtering is performed by integration over a finite interval of time. Author

N77-12956# Academy of Sciences (USSR), Moscow. Space Research Inst.
SEARCH OF INVISIBLE SUPERNOVAE
O. F. Prilutskii 1976 10 p refs
(D-236) Avail: NTIS HC A02/MF A01

The possibility of observing the outburst of supernovae in the remote galaxy regions, invisible within the optical band because of interstellar extinction, using thermal IR-radiation of interstellar dust heated by supernova outburst is discussed. Investigation of this phenomenon by means of cooled IR telescopes will allow the supernova outburst parameters to be determined and the characteristics of the interstellar dust distribution to be studied. Similar effects can be detected in the vicinities of the well-known remnants of supernovae, in particular, near Tycho Brahe and Cassiopeia A supernovae. Author (ESA)

N77-12957# Royal Observatory, Edinburgh (Scotland).
SPECTROPHOTOMETRY OF COOL STARS IN THE NEAR INFRARED. PART 3: RESULTS FOR A REGION IN THE DIRECTION OF l 2 = 138 deg
K. Nandy and F. Smriglio (Rome Univ.) 1976 15 p Repr. from Publ. Roy. Obs. (Edinburgh), v. 9, no. 4, 1976 p 117-123 (ISBN-0-902553-13-5) Avail: NTIS HC A02/MF A01; Roy. Obs. Edinburgh

The distribution of M stars brighter than V = 15 m.0 in two fields of 3 square degrees each in the direction of l 2 = 138 deg was studied. The spectra were classified from the relative strengths of molecular bands visible in the infrared in low dispersion objective prism spectra. Infrared I magnitudes of M stars are obtained from photographic photometry to an accuracy of + or - 0.1 m. The space density shows a maximum at a distance of 2 kpc and then falls off sharply. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N77-12958 George Washington Univ., Washington, D.C.
SCHREIBERSITE GROWTH AND ITS INFLUENCE ON THE METALLOGRAPHY OF COARSE STRUCTURED IRON METEORITES Ph.D. Thesis
Roy Slayton Clarke, Jr. 1976 207 p
Avail: Univ. Microfilms Order No. 76-22974

The relationship of schreibersite growth to Widmanstatten pattern development was examined using selected low Ni iron meteorites: the hexahedrites Coahuila and Bellsbank, the coarse octahedrite Ballinger, Santa Luzia, Lexington County, Bahjoi, and Balfour Downs, and the medium octahedrite Goose Lake. Fe-Ni-P equilibrium phase diagram was used to explain the development of gross structural features by cooling through the subsolidus temperature range of 995 to 550 C. Structural class is dependent essentially only on bulk Ni content, and P concentration controls the amount of schreibersite formed. Segregation of P as massive schreibersite begins at 850 C or higher and is largely complete by 600 C. Widmanstatten pattern development in the coarser structured meteorites is affected by the presence of P. The temperature at which kamacite nucleates is increased, as is the temperature range through which structure develops.
Dissert. Abstr.

N77-12959*# National Aeronautics and Space Administration, Washington, D.C.
EVOLUTION OF THE SOLAR SYSTEM
Hannes Alfven (Calif. Univ., San Diego) and Gustaf Arrhenius (Scripps Institution of Oceanography, San Diego) 1976 611 p refs
(NASA-SP-345) Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The origin and evolution of the solar system are analyzed. Physical processes are first discussed, followed by experimental studies of plasma-solid reactions and chemical and mineralogical analyses of meteorites and lunar and terrestrial samples. For individual titles, see N77-12960 through N77-12984.

N77-12960*# National Aeronautics and Space Administration, Washington, D.C.
THE PRESENT STRUCTURE OF THE PLANETARY AND SATELLITE SYSTEMS
In its Evolution of the Solar System 1976 p 15-33 (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The orbital and physical properties of the planets and satellites of the solar system are discussed and tabulated. Prograde and retrograde satellites are briefly considered. The Laplacian model of planetary evolution is evaluated with particular attention to the mass distribution of the Laplacian nebula, and the Titius-Bode law is briefly discussed. D.M.L.

N77-12961*# National Aeronautics and Space Administration, Washington, D.C.
THE MOTION OF PLANETS AND SATELLITES
In its Evolution of the Solar System 1976 p 37-47 (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The guiding center approximation of celestial mechanics is first discussed. The circular orbit is then considered followed by factors which modify the circular orbit. D.M.L.

N77-12962*# National Aeronautics and Space Administration, Washington, D.C.
THE SMALL BODIES
In its Evolution of the Solar System 1976 p 51-69 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Asteroids, comets, and meteoroids are discussed. Orbital characteristics are given particular attention. D.M.L.

N77-12963*# National Aeronautics and Space Administration, Washington, D.C.
FORCES ACTING ON SMALL BODIES
In its Evolution of the Solar System 1976 p 73-82 (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The effects of gravitational fields, electromagnetic forces, and solar radiation on the orbital motion of the smaller bodies, particularly interplanetary dust, of the solar system are discussed. D.M.L.

N77-12964*# National Aeronautics and Space Administration, Washington, D.C.
KEPLER MOTION OF INTERACTING BODIES; JET STREAMS
In its Evolution of the Solar System 1976 p 85-104 (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The effects of collisions in the asteroid belt and in meteor streams on the Kepler motion of these bodies are considered. It is shown that under certain conditions collision-perturbed Kepler motion results in the formation of self-focused streams of particle aggregates. It is suggested that meteor streams of the asteroidal jet streams may be of this type. It is further argued that jet streams were of decisive importance as an intermediate stage in the accretion of planets and satellites from grains. Author

N77-12965*# National Aeronautics and Space Administration, Washington, D.C.
COLLISIONS: FRAGMENTATION AND ACCRETION
In its Evolution of the Solar System 1976 p 107-119 (For

primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Possible mechanisms for the production of asteroids and meteoroids are considered. These include the fragmentation of larger bodies formed earlier by accretion, and the accretion of grains produced by condensation of plasma and of fragments formed in breakup events. D.M.L.

N77-12966*# National Aeronautics and Space Administration, Washington, D.C.
RESONANCE STRUCTURE IN THE SOLAR SYSTEM
In its Evolution of the Solar System 1976 p 123-143 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Orbit-orbit resonances and spin-orbit resonances of planets, natural satellites and asteroids in the solar system are discussed. D.M.L.

N77-12967*# National Aeronautics and Space Administration, Washington, D.C.
SPIN AND TIDES
In its Evolution of the Solar System 1976 p 147-158 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The tides of celestial bodies and their effects on rotation are discussed. The earth-moon system is used as an example of the tidal braking of planetary spins. The similarity of the rotational periods of various bodies in the solar system (spin isochronism), despite large variations in mass, is also analyzed. D.M.L.

N77-12968*# National Aeronautics and Space Administration, Washington, D.C.
POST-ACCRETIONAL CHANGES IN THE SOLAR SYSTEM
In its Evolution of the Solar System 1976 p 161-165 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The stability of the orbits and rotation of bodies in the solar system is discussed. Resonance and tidal effects are considered. D.M.L.

N77-12969*# National Aeronautics and Space Administration, Washington, D.C.
ACCRETIONAL PROCESSES
In its Evolution of the Solar System 1976 p 171-186 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Possible mechanisms for the formation of the planets, natural satellites, and asteroids in the solar system are evaluated. The mechanisms studied include the gravitational collapse of a gas cloud, planetesimal accretion, gravitational and nongravitational accretion, and the accretion of resonance-captured grains. D.M.L.

N77-12970*# National Aeronautics and Space Administration, Washington, D.C.
ON THE ACCRETION OF PLANETS AND SATELLITES
In its Evolution of the Solar System 1976 p 189-209 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The planetesimal theory of planetary evolution is first described and weaknesses in the theory are pointed out. It is suggested that the formation of jet streams as an intermediate step in this process would resolve these problems. A mathematical model for the accretion of planets from jet streams is proposed. D.M.L.

N77-12971*# National Aeronautics and Space Administration, Washington, D.C.
SPIN AND ACCRETION
In its Evolution of the Solar System 1976 p 213-227 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The effect of accretion on the rotation of celestial bodies, primarily planets and planetesimals, is analyzed. D.M.L.

N77-12972*# National Aeronautics and Space Administration, Washington, D.C.
RELATIONS BETWEEN COMETS AND METEOROIDS
In its Evolution of the Solar System 1976 p 231-238 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Several questions based on the definite correlation between comets and meteor streams are discussed. These include: (1) are meteoroids derived from comets; (2) are comets accreted from meteor streams; and (3) are the processes reciprocal. The chemical composition of the nucleus, the mechanisms for the production of the observed radicals and ions, and the nature of the interaction between comets and solar wind are included. J.M.S.

N77-12973*# National Aeronautics and Space Administration, Washington, D.C.
PLASMA PHYSICS AND HETEGONY
In its Evolution of the Solar System 1976 p 243-261 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

It is shown that the essential features of the present structure of the solar system can be understood if an original population of grains with certain properties is postulated. The dynamics, chemical, and structural properties of these grains are discussed along with the processes by which a population of grains with these required properties could have originated. J.M.S.

N77-12974*# National Aeronautics and Space Administration, Washington, D.C.
MODEL OF THE HETEGONIC PLASMA
In its Evolution of the Solar System 1976 p 265-284 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

A mathematical model of the formation of grains is developed. Factors considered include: (1) magnetized central body; (2) angular momentum; (3) the transfer of angular momentum; (4) support of the primordial cloud; and (5) the plasma as a transient state. Conclusions concerning the model are presented. The hetegonic nebulae and irradiation effects are discussed along with the model and the hetegonic principle. J.M.S.

N77-12975*# National Aeronautics and Space Administration, Washington, D.C.
TRANSFER OF ANGULAR MOMENTUM AND CONDENSATION OF GRAINS
In its Evolution of the Solar System 1976 p 287-298 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The plasma processes which lead to the formation of grains are examined. Factors discussed include: Ferraro isorotation and partial corotation; partial corotation of a plasma in magnetic and gravitational fields; condensation of the plasma; the two-thirds law; and energy release during angular momentum transfer. J.M.S.

N77-12976*# National Aeronautics and Space Administration, Washington, D.C.
ACCRETION OF THE CONDENSATION PRODUCTS
In its Evolution of the Solar System 1976 p 301-322 refs (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The development of a population of orbiting grains is discussed with the aim of developing three theories: a theory of the formation of the Saturnian rings; a theory of the formation of the asteroid belt; and a theory of the formation of jet streams as an intermediate stage in the formation of satellites and planets. Specifically, the accretion of grains and the formation of jet streams are studied and the products of these processes are compared with observations. J.M.S.

N77-12977*# National Aeronautics and Space Administration, Washington, D.C.
TRANSPLANETARY CONDENSATION
In its Evolution of the Solar System 1976 p 325-334 (For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Planetary formation is seen as the end product of the transfer of angular momentum from the sun to a surrounding plasma and the condensation of the plasma. The process by which the

condensation took place outside the transfer limit is discussed. It is shown that the transplanetary condensation results in the formation of the comet-meteoroid population and the enrichment of condensable elements in the A, B, and C clouds. J.M.S.

N77-12978*# National Aeronautics and Space Administration, Washington, D.C.
CHEMICAL STRUCTURE OF THE SOLAR SYSTEM
In its Evolution of the Solar System 1976 p 339-366 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Differences in chemical composition among the different outer planets, among the terrestrial planets, and among the small bodies in the solar system are discussed. It is indicated that these differences are caused by fractionation processes operating on matter in the solar system, before or during the formative state. Observational evidence for the chemically fractionated state of the solar system is presented. J.M.S.

N77-12979*# National Aeronautics and Space Administration, Washington, D.C.
MASS DISTRIBUTION AND THE CRITICAL VELOCITY
In its Evolution of the Solar System 1976 p 369-406 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Processes which influence the composition of the solar system are discussed. These include the following: (1) the critical velocities of the element groups corresponding to clouds A, B, C, and D; (2) the vapor pressure of the solids that can form from the gases controlling the cloud formation; (3) the fractional vaporization of infalling transplanetary material in the dense A and B clouds, preferentially depositing refractory elements in the central reactive hydrogen cloud (B cloud); (4) trapping of infalling gases with high critical velocities in already established clouds; (5) fractionation at condensation, due to the gradient in the solar radiation field; and (6) gravitational accumulation of hydrogen and helium by the giant planets. J.M.S.

N77-12980*# National Aeronautics and Space Administration, Washington, D.C.
METEORITES AND THEIR PRECURSOR STATES
In its Evolution of the Solar System 1976 p 409-426 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

An interpretation of the evolutionary record in meteorites is presented. Sources of meteorites, selection effects, and upper size limits of meteorite precursor bodies are discussed along with precursor states of meteorite parent bodies, jet stream evolution and properties of meteorites, and cohesive forces in meteoritic material. Evolutionary sequence of precursor states of meteorites and age relationships in the evolution of meteorite parent jet streams are included. J.M.S.

N77-12981*# National Aeronautics and Space Administration, Washington, D.C.
THE STRUCTURE OF THE GROUPS OF SECONDARY BODIES
In its Evolution of the Solar System 1976 p 429-448 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The internal structures of the different groups of secondary bodies are discussed. It is shown that these structures differ in that in some of them the mass of the bodies decreases rapidly with increasing distance from the central body, whereas in other groups the reverse is true. It is indicated that this difference in structure among the groups is related to the total energy dissipated in the process of emplacement of the plasma. J.M.S.

N77-12982*# National Aeronautics and Space Administration, Washington, D.C.
ORIGIN AND EVOLUTION OF THE EARTH-MOON SYSTEM
In its Evolution of the Solar System 1976 p 453-469 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The hetegonic aspect of lunar evolution is considered. The capture theory, tidal evolution of the lunar orbit, accretion and the heat structure of the moon, and composition of the moon are among the topics discussed. Conclusions are presented. J.M.S.

N77-12983*# National Aeronautics and Space Administration, Washington, D.C.
THE PROPERTIES OF THE EARLY SUN
In its Evolution of the Solar System 1976 p 473-480 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

Characteristics of the primeval sun during the period the planets formed around it are studied, based on the assumption that the planetary system was formed by the same processes that produce satellites. The mass, magnetic field, and spin of the early sun are calculated and its light and solar wind emission are discussed. J.M.S.

N77-12984*# National Aeronautics and Space Administration, Washington, D.C.
ORIGIN OF THE EARTH'S OCEAN AND ATMOSPHERE
In its Evolution of the Solar System 1976 p 483-500 refs
(For primary document see N77-12959 03-90)
Avail: NTIS MF A01; SOD HC $11.00 CSCL 03B

The processes by which the earth formed are discussed in relation to the formation of the earth ocean and atmosphere. Remote and immediate precursor states, accumulation of water during the accretion of the earth, and the introduction of water in the lithosphere are considered along with the relation between the ocean and the earth-moon system. J.M.S.

N77-12985# Owens Valley Radio Observatory, Pasadena, Calif.
A HIGH ANGULAR RESOLUTION STUDY OF THE NEUTRAL HYDROGEN IN THE IrrII GALAXY M82
S. T. Gottesman (Fla. Univ.) and L. Weliachew (Observatoire de Meudon, France) 1976 33 p refs
(Contract N00014-67-A-0094-0019)
(AD-A024806; Rept-1976-8) Avail: NTIS HC A03/MF A01 CSCL 03/2

A 4.4 arc min resolution survey of the HI structure and kinematics of a region centered on M 82 is presented. Based upon these observations a model of IrrII or IO galaxies is presented. It is suggested that most of these peculiar galaxies were gas-poor ellipticals or SO systems that have experienced a recent injection of fresh gas. The effects of this activity account for the present disordered and chaotic appearance of these systems. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N77-12986*# Joint Publications Research Service, Arlington, Va.
JUPITER AND SATURN. GIANTS OF THE SOLAR SYSTEM
V. G. Teyfel Washington NASA Nov. 1976 56 p Transl. into ENGLISH of the book "Jupiter i Saturn - Giganty solnechnoy sistemy" Moscow, 1976 p 1-64
(NASA Order W-13183)
(NASA-TT-F-17274) Avail: NTIS HC A04/MF A01 CSCL 03B

The present level of knowledge concerning the planets Jupiter and Saturn is reviewed. General information is followed by data on chemical composition, atmospheric structure, atmospheric aerosols, the Jovian magnetic field, and the satellites of the two giant planets. Author

N77-12987*# California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
EQUATIONS OF STATE AND IMPACT-INDUCED SHOCK-WAVE ATTENUATION ON THE MOON

Thomas J. Ahrens and John D. OKeefe (Calif. Univ., Los Angeles) 1976 31 p refs
(Grant NsG-7129)
(NASA-CR-149245; Contrib-2844) Avail: NTIS HC A03/MF A01 CSCL 03B

Current equation of state formulations, used for finite difference cratering flow calculations, are cast into a framework permitting comparison of peak pressures attained upon impact of a sphere, with a half-space, along the impact symmetry axis, to one dimensional impedance match solutions. On the basis of this formulation and application of thermochemical data, the regimes of melting and vaporization are examined. For the purpose of identifying material which will, upon isentropic release from the impact-induced shock state, result in a solid just brought to its melting point, i.e., incipiently melted (IM); completely melted (CM); just brought to its boiling point, i.e., incipiently vaporized (IV); and completely vaporized (CV) state, the pressures at which the critical isentropes intersect the Hugoniots of iron and gabbroic anorthosite (GA) are examined in detail. The latter rock type is assumed to be representative of the lunar highlands. The Hugoniot pressures, for which IM, CM, IV, and CV will occur upon isentropic expansion, are calculated to be 2.2, 2.6, 4.2, and 16.8 Mbar, respectively. Author

N77-12988*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
COMPUTER SIMULATIONS OF PLANETARY ACCRETION DYNAMICS: SENSITIVITY TO INITIAL CONDITIONS
Richard Isaacman and Carl Sagan Oct. 1976 57 p refs
(Contract NGR-33-010-082)
(NASA-CR-149214; CRSR-648) Avail: NTIS HC A04/MF A01 CSCL 03B

The implications and limitations of program ACRETE were tested. The program is a scheme based on Newtonian physics and accretion with unit sticking efficiency, devised to simulate the origin of the planets. The dependence of the results on a variety of radial and vertical density distribution laws, the ratio of gas to dust in the solar nebula, the total nebular mass, and the orbital eccentricity of the accreting grains was explored. Only for a small subset of conceivable cases are planetary systems closely like our own generated. Many models have tendencies towards one of two preferred configurations: multiple star systems, or planetary systems in which Jovian planets either have substantially smaller masses than in our system or are absent altogether. But for a wide range of cases recognizable planetary systems are generated - ranging from multiple star systems with accompanying planets, to systems with Jovian planets at several hundred AU, to single stars surrounded only by asteroids. Author

N77-12989*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
CHARGED-PARTICLE ABSORPTION BY Io Interim Report
Michael Schulz and Aharon Eviatar (Calif. Univ., Los Angeles) 4 Nov. 1976 22 p refs
(Grants NGL-05-007-190-S4; NSF GA-34148; Contract F04701-75-C-0076)
(NASA-CR-149162; TR-0077(2260-20)-4) Avail: NTIS HC A02/MF A01 CSCL 03B

An idealized two-dimensional model of the distorted electric field configuration, in the limit of a perfectly conducting satellite or satellite ionosphere, has been constructed. This model has been used to trace the adiabatic guiding-center trajectories of energetic protons and electrons across Jupiter's magnetic-field lines, which are taken as rectilinear. The adiabatic trajectories of very low-energy particles (cold-plasma) are thus found to avoid the satellite and escape absorption. In the limit of very high particle energies the adiabatic trajectories are undistorted, and absorption proceeds as if Io were an insulator. The particle absorbing characteristics of an electrically conducting Jovian satellite are found to depend on both the species and the energy of the incident particle, and the satellite's particle-absorbing cross section differs systematically from its geometric cross section. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N77-12990*# National Aeronautics and Space Administration, Washington, D.C.
SOLAR AND MAGNETOSPHERIC SCIENCE
Adrienne F. Timothy, Erwin R. Schmerling, and Robert D. Chapman Dec. 1976 44 p
(NASA-TM-X-3440) Avail: NTIS HC A03/MF A01 CSCL 03B

The current status of the Solar Physics Program and the Magnetospheric Physics Program is discussed. The scientific context for each of the programs is presented, then the current programs and future plans are outlined. Author

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N77-12991# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
A DETECTOR TEST FOR LOW BACKGROUND MEASUREMENT
S. Risica 14 Oct. 1975 65 p refs In ITALIAN; ENGLISH summary
(ISS-T-75/11) Avail: NTIS HC A04/MF A01

Tests performed at the Physics Laboratories during 1974 to measure and optimize the features of a low background detection system are reported. The instruments under study included two gamma-ray detectors, a NaI (T1) scintillator and a Ge(Li) semiconductor; the performance characteristics of both detectors were compared. The other instrument was an alpha-beta particle counter (proportional counter) with low background counting. These detection systems were developed in order to differentiate the radionuclides polluting the earth atmosphere and to measure accurately their concentration and therefore monitor the environment radioactivity level. ESA

99 GENERAL

N77-12992*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INFORMATION ON THE METRIC SYSTEM AND RELATED FIELDS
Ernst Lange Washington Nov. 1976 631 p refs Prepared in cooperation with Metric Association, Inc.
(NASA-TM-X-3449; M-194) Avail: NTIS HC A99/MF A01 CSCL 05B

This document contains about 7,600 references on the metric system and conversion to the metric system. These references include all known documents on the metric system as of December 1975, the month of enactment of the Metric Conversion Act of 1975. This bibliography includes books, reports, articles, presentations, periodicals, legislation, motion pictures, TV series, film strips, slides, posters, wall charts, education and training courses, addresses for information, and sources for metric materials and services. A comprehensive index is provided. Author

N77-12993*# Agence Tunisienne de Public-Relations, Tunis.
MAX VALIER: A PIONEER OF SPACE TRAVEL
I. Essers Washington NASA Nov. 1976 274 p refs Transl. into ENGLISH of the book "Max Valier. Ein Vorkampfer der Weltraumfahrt. 1895-1930" Dusseldorf, VDI-Verlag GmBH, 1968 p 1-314 Sponsored by NASA

(NASA-TT-F-664) Avail: NTIS HC A12/MF A01 CSCL 05D

A biography is presented of Max Valier, who is credited with popularizing interest in space travel and rocket research in Germany in the 1920's and 1930's. He died in an accident involving the testing of liquid rocket fuel propellants. Author

N77-12994# Informatics, Inc., Rockville, Md.

SOVRAD: A DIGEST OF RECENT SOVIET R AND D ARTICLES, VOLUME 2, NUMBER 3, 1976

Stuart G. Hibben, L. H. Boylan, J. Kourilo, and B. Shresta Mar. 1976 18 p refs

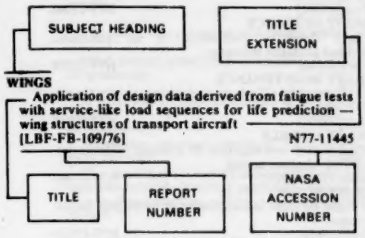
(Contract MDA903-76-C-0254; DARPA Order 3097)

(AD-A025814) Avail: NTIS HC A02/MF A01 CSCL 04/2

Contents: Acoustic Noise in Turbulence, Self-Focusing of Ultra and Hypersound, Increased Emphasis on Dolphin Research, Laser-Driven Reaction Engine, High Temperature Press, Solids Under Megabar Pressure, Hybrid Magnet Develops 250,000 Oersted, Storage Battery for Aircraft, Tunable Silicon Carbide Photosensor, New Electron Gun; Magnetic Suspension of Rotors, Seminar on Optical Data Processing, Remote Temperature Sensor Optimization, More Theory on Ball Lightning. GRA

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

ABEL FUNCTION
Purity and imbeddedness in Abelian torsion groups
N77-12826

ABSORPTANCE
Absorptance calculations for a multilayer absorbing stack: Application to thin film photoconductor assemblies
[AD-A025798] N77-12868

ABSORPTION SPECTRA
The determination of trace amounts of aluminium, bismuth, chromium and antimony in steels by flameless atomic absorption spectrophotometry
[PB-256053/0] N77-12204

ABSORPTIVITY
Investigation of the absorption coefficients of Ge and MgF2 in the ultraviolet, visible, and near-infrared spectrum ranges in the 300 - 800 K band
N77-12856

AC GENERATORS
The feasibility of a storable propellant turbine/high-speed alternator as a compact short-life power system for hardened ballistic missile defense [BMD] installations
[AD-A024786] N77-12543

ACCELERATION [PHYSICS]
Measurement of the motion of trees in two dimensions — using manual and wind excitation
[ISVR-TR-86] N77-12437

ACCELERATION STRESSES [PHYSIOLOGY]
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 — reflex movements of the eye
[DRB-DR-225] N77-12671
Subjective detection of vertical acceleration: A velocity dependent response?
N77-12678
Human subjective and reflex responses to sinusoidal vertical acceleration
N77-12679
Effects of acceleration on selected serum enzymes
[AD-A025965] N77-12691

ACCELERATION TOLERANCE
Test plot evaluation of a reclined cockpit seat as an aid to G tolerance and performance
[AD-A025784] N77-12703

ACCELEROMETERS
A study of servo accelerometer design for low frequency vibration measurement — of large structures
[ISVR-TR-85] N77-12369

ACCIDENT PREVENTION
Implementation of proven technology in making the highway environment safe
[PB-256664] N77-12950

ACCUMULATIONS
Oxygen accumulation in hypobaric chambers
[AD-A025860] N77-12073

ACCUMULATORS
An 82 to 84 percent efficient, small size, 2 and 4 stage depressed collector for octave bandwidth high performance TWT's
[NASA-TM-X-73572] N77-12297

ACOUSTIC ATTENUATION
Investigate feasibility of utilizing acoustic emission methods to evaluate the integrity of a prototype ADAPTS oil storage container
[AD-A025910] N77-12425

ACOUSTIC MEASUREMENTS
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832

ACOUSTIC PROPERTIES
Inlet total pressure loss due to acoustic wall treatment
[NASA-TM-X-73559] N77-11991

ACOUSTIC SOUNDING
Pulse analysis of acoustic emission signals
N77-12831

ACOUSTICAL HOLOGRAPHY
Vibration and sound radiation of a plate
[AD-A024985] N77-12464

ACOUSTO-OPTICS
Design, construction and evaluation of a high pressure, high electric field optoacoustic detector
[AD-A025772] N77-12864

ACTUATOR DISKS
Development of an optical disc recorder
[AD-A025291] N77-12372

ACTUATORS
SAM-D trade-off study, Electromechanical Control Actuation System [em/CAS]
[AD-A025232] N77-12104
Mechanical damping of flywheel stabilization systems
N77-12404

ADAPTIVE CONTROL
Multidither adaptive algorithms
[AD-A025185] N77-12765
Control for large scale and uncertain systems
[AD-A025819] N77-12779
Predetection compensated imaging
[AD-A025190] N77-12870

ADDITIVES
Optimization of PT-doped Kocite [trademark] electrodes in H3 PO4 fuel cells
[AD-A025326] N77-12529

ADHESIVE BONDING
The effect of adhesive layer on crack propagation in laminates
N77-12132
Surface analysis of 6061 and 7050 aluminum alloys after conditioning by chemical treatment
[AD-A025736] N77-12200
Bonding of elevated temperature strain gages to humid aged graphite tensile specimens through the use of anaerobic adhesives
[AD-A025920] N77-12223
Scanning electron microscopy, ion scattering and secondary ion mass spectrometry to characterize apparent adhesive failure in an adhesive bond
[AD-A025615] N77-12442

ADHESIVES
Minuteman stage 3 component report
[AD-A025093] N77-12103

ADIABATIC CONDITIONS
Charged-particle absorption by Io
[NASA-CR-149162] N77-12989

AERIAL PHOTOGRAPHY
Digital orthophoto study Add-On
[AD-A025690] N77-12498
A new photogrammetric comparator design
[AD-A025977] N77-12503

AERIAL RECONNAISSANCE
An algorithm for the analysis of reconnaissance imagery
[AD-A025964] N77-12487

AERODYNAMIC CHARACTERISTICS
Cold-air performance of a tip turbine designed to drive a lift fan. 1: Baseline performance
[NASA-TM-X-3452] N77-12000
Airworthiness and flight characteristics evaluation: YAH-1S improved Cobra agility and maneuverability helicopter
[AD-A025476] N77-12043
Effects of upper-surface blowing and thrust vectoring on low speed aerodynamic characteristics of a large-scale supersonic transport model
[NASA-TN-D-8296] N77-12065
FORTRAN programs for the determination of aerodynamic derivatives from transient longitudinal or lateral responses of aircraft
[ARC-CP-1344] N77-12067

AERODYNAMIC COEFFICIENTS
Aerodynamic coefficients and position of the bow shock wave of circular cones with pointed and spherically blunted noses in supersonic flow
[ESA-TT-335] N77-12005
Wind tunnel models for aero-optical interaction study
[AD-A024925] N77-12078

AERODYNAMIC CONFIGURATIONS
Wind tunnel tests and aerodynamic computations; thoughts on their use in aerodynamic design
N77-11979
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
Effect of specific configuration changes on the aerodynamics of the MSC-040-A orbiter at transonic speeds
[ESA-TT-332] N77-12002
A low speed wind tunnel test of a 0.050 scale model of shuttle orbiter [model 089B] to investigate the longitudinal and lateral directional effects of canard and tail configurational modifications in the LTV LSWT [MA14]
[NASA-CR-147649] N77-12111

AERODYNAMIC DRAG
Design of turbine, using distributed or average losses; effect of blowing
N77-12021

AERODYNAMIC HEAT TRANSFER
Summary of NASA aerodynamic and heat transfer studies in turbine vanes and blades
[NASA-TM-X-73518] N77-12059

AERODYNAMIC LOADS
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430

AERODYNAMICS
Fourier analysis and the correlation of speed with nonstationary aerodynamics
N77-11985
French contribution to aerodynamics of gas-particle mixtures
N77-12353

AEROSOLS
Species-differentiating continuous monitor for airborne acids
[AD-A025917] N77-12570
A diffraction technique to measure size distribution of large airborne particles
[PB-255454/1] N77-12599
Aerosol spectroscopy in the infrared
[AD-A025985] N77-12631

AEROSPACE ENGINEERING
F. A. Tsander and modern cosmonautics
[NASA-TT-F-17096] N77-12080
Research and technology objectives and plans. A summary, FY 1977 research and technology program
[NASA-TM-X-74296] N77-12925

AEROSPACE ENVIRONMENTS
General purpose rocket furnace
[NASA-CASE-MFS-23460-1] N77-12070
Review study and evaluation of possible flight experiments relating to cloud physics experiments in space
[NASA-CR-150066] N77-12638
Float-zone processing in a weightless environment
[NASA-CR-2768] N77-12954

AEROSPACE MEDICINE
Aeronautical Engineering: A special bibliography with indexes, supplement 74 — Aerospace Medicine and Biology bibliography, supplement [74]. September 1976
[NASA-SP-7037[74]] N77-11967
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 159
[NASA-SP-7011[159]] N77-12670

DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 --- reflex movements of the eye
[DRB-DR-225] N77-12671
Automated electroencephalography system and electroencephalographic correlates of space motion sickness, part 2 --- sleep characteristics
[NASA-CR-151106] N77-12680
Biomedical technical transfer. Applications of NASA science and technology
[NASA-CR-149161] N77-12935

AEROSPACE SCIENCES
F. A. Tsander and modern cosmonautics
[NASA-TT-F-17096] N77-12080
Research and technology objectives and plans. A summary, FY 1977 research and technology program
[NASA-TM-X-74296] N77-12925

AEROSPACE SYSTEMS
Control for large scale and uncertain systems
[AD-A025819] N77-12779

AFTERBODIES
Supersonic aircraft after body study of a thick boundary layer on a two-dimensional step
[LRBA-E-815-PV-4/SAE] N77-12001

AGRICULTURE
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243
Low cost data and text communication for the less developed countries: A study with special reference to the needs of the international agricultural research centers
[PB-256067/0] N77-12271
The Ohio land allocation model, phase 2
[E77-10042] N77-12472

AIR
The kinetics of evolution of water vapor clusters in air
[AD-A025675] N77-12349
Equilibrium compositions and compressibility factors for air in the temperature range 1500 to 13000 Kelvin and for densities from 0.000001 to 1000 times standard density
[AD-A025449] N77-12916

AIR BREATHING ENGINES
Experiments and analysis related to external burning for propulsion
[AD-A024984] N77-12128

AIR CARGO
Code of federal regulations. 14. Aeronautics and space, parts 200 to 1199 --- regulations and standards for the civil aeronautics board
N77-12934

AIR CONDITIONING
Temperature distribution of a hot water storage tank in a simulated solar heating and cooling system
[NASA-TM-X-73549] N77-12521
Evaluation of the air-to-air heat pump for residential space conditioning
[PB-255652/0] N77-12545

AIR CONDITIONING EQUIPMENT
Measured performance of a 3 ton LiBr absorption water chiller and its effect on cooling system operation
[NASA-TM-X-73496] N77-12518

AIR COOLING
Feasibility study for a direct, air-cooled condensation system
[PB-256403/7] N77-12537

AIR FLOW
Atmospheric flow over two-dimensional bluff surface obstructions
[NASA-CR-2750] N77-11996

AIR NAVIGATION
Concerning flight and the correction of presbyopia
N77-12713

AIR POLLUTION
The use of a prototype cryogenic gas chromatograph in combination with PTGC for analysis of inorganic and organic gases: Application to air pollution studies
N77-12144
Photochemical air pollution: Weekday-weekend differences
N77-12557
Priorities in air pollution source control: Modeling of population exposures and health effects
N77-12558
Review of present knowledge of plant injury by air pollution
[WMO-431] N77-12559
Measurement of atmospheric sulfates: Literature search and methods selection
[PB-254387/4] N77-12562
A passive personal sampler for nitrogen dioxide
[PB-254447/6] N77-12565
Quality assurance handbook for air pollution measurement systems. Volume 1: Principles
[PB-254658/8] N77-12567
Species-differentiating continuous monitor for airborne acids
[AD-A025917] N77-12570
A bioenvironmental study of emissions from refuse derived fuel
[AD-A024661] N77-12571
Air quality considerations in transportation planning: Findings and recommendations on transportation control planning, phase 2
[PB-256424/3] N77-12576
Growth effects of major land use projects. Volume 3: Summary
[PB-256204/9] N77-12583
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585
Compliance status of major air pollution facilities
[PB-256653/7] N77-12588
Air quality models required data characterization
[PB-255730/4] N77-12589
A method for the determination of total mercury in ambient air
[PB-255698/3] N77-12590
Laws and regulations affecting coal with summaries of Federal, State, and local laws and regulations pertaining to air and water pollution control, reclamation, diligence and health and safety, part 1
[PB-255927/6] N77-12592
Rapping reentrainment in a nearly full-scale pilot electrostatic precipitator
[PB-255984/7] N77-12595
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
Laboratory analysis of solvent refined coal
[PB-255550/6] N77-12598
A diffraction technique to measure size distribution of large airborne particles
[PB-255454/1] N77-12599
Vapor phase spectra for air pollution studies
[AD-A025156] N77-12603
Measurement of gaseous minor constituents in the natural stratosphere --- to predict stratospheric pollution by supersonic aircraft flight
[ESA-TT-337] N77-12615

AIR QUALITY
Directory of air quality monitoring sites active in 1974
[PB-256708/9] N77-12578
Air quality models required data characterization
[PB-255730/4] N77-12589

AIR SAMPLING
Quality assurance handbook for air pollution measurement systems. Volume 1: Principles
[PB-254658/8] N77-12567
Directory of air quality monitoring sites active in 1974
[PB-256708/9] N77-12578
A diffraction technique to measure size distribution of large airborne particles
[PB-255454/1] N77-12599

AIR TO AIR MISSILES
Results of some investigations of differential gain theory applied to air-to-air systems. Volume 2: Stochastic differential games with complexity constrained strategies for air-to-air systems
[AD-A025322] N77-12008

AIR TRAFFIC
Code of federal regulations. 14. Aeronautics and space, parts 200 to 1199 --- regulations and standards for the civil aeronautics board
N77-12934

AIR TRAFFIC CONTROL
Narrow-band passive systems theory with applications to positioning and navigation
[AD-A025743] N77-12036
Code of federal regulations. 14. Aeronautics and space, parts 1 to 59 --- federal aviation procedural rules and standards
N77-12932
Code of federal regulations. 14. Aeronautics and space, parts 60 to 199 --- federal aviation procedural rules and standards
N77-12933

AIR TRANSPORTATION
Backlog and delay with wartime airlift
[AD-A025959] N77-12028
Code of federal regulations. 14. Aeronautics and space, parts 200 to 1199 --- regulations and standards for the civil aeronautics board
N77-12934

AIR WATER INTERACTIONS
Waves generated by a uniformly moving oscillatory surface effect ship
[AD-A025129] N77-12011
Some aspects of the influence of abnormal eastern equatorial Pacific Ocean surface temperatures upon weather patterns in the southwestern United States, volume 2
[AD-A024710] N77-12651
Past air-sea interactions over the eastern North Pacific Ocean as revealed by tree-ring data
N77-12660

AIRBORNE EQUIPMENT
Parametric analysis of laser target designators for airborne applications
[AD-A025659] N77-12397

AIRBORNE/SPACEBORNE COMPUTERS
Onboard experiment data support facility. Task 2 report: Definition of onboard processing requirements
[NASA-CR-151108] N77-12120

AIRCRAFT ACCIDENTS
Full-scale crash test of a CH-47C helicopter
[NASA-TM-X-3412] N77-12027

AIRCRAFT CONTROL
An experimental investigation of the flap-lag stability of a hingeless rotor with comparable levels of hub and blade stiffness in hovering flight
[NASA-CR-151924] N77-12040

AIRCRAFT ENGINES
Auxiliary power system for activity cooled aircraft
[NASA-CASE-LAR-11626-1] N77-12332

AIRCRAFT EQUIPMENT
Environmental effects on maintenance costs for aircraft equipment
[AD-A025801] N77-12048

AIRCRAFT GUIDANCE
Flight simulator evaluation of an electronic paravisual guidance indicator
[ESA-TT-330] N77-12056

AIRCRAFT MAINTENANCE
Environmental effects on maintenance costs for aircraft equipment
[AD-A025801] N77-12048

AIRCRAFT MODELS
Wind tunnel investigation of internally blown jet-flap STOL airplane model
[NASA-TN-D-8309] N77-11995

AIRCRAFT NOISE
In-flight far-field measurement of helicopter impulsive noise
[AD-A025979] N77-12060
A new capability for predicting helicopter rotor noise in hover and in flight
[NASA-CR-147138] N77-12064

AIRCRAFT PERFORMANCE
A method for the analysis of nonlinearities in aircraft dynamic response to atmospheric turbulence
[NASA-TN-D-8265] N77-11992

AIRCRAFT PILOTS
Pilot opinion of flight displays and monitoring gauges in the UH-1 helicopter
[AD-A024714] N77-12579
Visual aids and eye protection for the aviator
[AGARD-CP-191] N77-12708
Integration of aviators eye protection and visual aids
N77-12710

AIRCRAFT STRUCTURES
Advanced helicopter structural design investigation. Volume 1: Investigation of advanced structural component design concepts
[AD-A024662] N77-12052

AIRCRAFT TIRES
Aircraft tires: Balance pad bonding integrity
[AD-A024815] N77-12413

AIRCRAFT WAKES
Summary and evaluation of theoretical developments relating to trailing wing tip vortices generated by aircraft
[AD-A025614] N77-12007
Velocity measurements on the aerodynamic wake of a hovercraft using laser Doppler anemometry
[UTIAS-TN-203] N77-12010

AIRFOILS
NS-4 coating process development for columbium alloy airfoils
[AD-A025797] N77-12139

AIRFRAME MATERIALS
Scramjet nozzle design and analysis as applied to a highly integrated hypersonic research airplane
[NASA-TN-D-8334] N77-11994

AIRFRAMES
Ceramic airframe bearings
[AD-A025142] N77-12420

AIRGLOW
Intensity variations of atmospheric hydroxyl emissions
[AD-A025274] N77-12618

AIRPORTS
Climatological data of Netherlands stations. Volume 9: Tables with data of aerodromes Amsterdam/Schiphol, Eindhoven/Eindhoven, Enschede/Twente, Groningen/Eelde, Maastricht/Zuid-Limburg and Rotterdam/Rotterdam according to observations in the period 1955 - 1970
[KNMI-150-9] N77-12646

ALASKA
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473

ALGAE
Removal of algae from waste stabilization pond effluent
[PB-256512/5] N77-12593
Paleobiology and paleoecology of middle Cambrian algae from western North America
N77-12604

ALGEBRA
A survey of parallel algorithms in numerical linear algebra
[AD-A024792] N77-12754
Induced representations and positive linear maps of ordinary C-algebras
N77-12787
A program for the numerical solution of large sparse systems of algebraic and implicitly defined stiff differential equations
[AD-A024764] N77-12804

ALGORITHMS
Application of the multirevolution orbit prediction method
[ESA-CR[P]-840] N77-12093
Optimal design of mechanical systems with intermittent motion
[AD-A025010] N77-12421
An algorithm for the analysis of reconnaissance imagery
[AD-A025964] N77-12487
Efficient algorithms for chordal graphs and interval graphs
N77-12742
The use of context in character recognition
N77-12744
Mask pattern generation techniques --- in computer programming
N77-12745
A survey of parallel algorithms in numerical linear algebra
[AD-A024792] N77-12754
Multidither adaptive algorithms
[AD-A025185] N77-12765
The development and Monte Carlo investigation of non-hierarchical clustering procedure, and its application to discrimination problems in industrial administration
N77-12812
An adaptive prediction filter algorithm for optimizing servo system performance
[AD-A025980] N77-12873
ALKENES
The diastereosequence distribution resulting from a two-state mechanism involving first order Markovian addition steps
N77-12129
ALKYL COMPOUNDS
Side chain crystallization of long side chain polymers
N77-12217
ALTITUDE SIMULATION
Oxygen accumulation in hypobaric chambers
[AD-A025860] N77-12073
ALUMINUM
Hardening characteristics of TI-6AL-2SN-4ZR-6MO alloy
[AD-A025307] N77-12191
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289
ALUMINUM ALLOYS
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy
N77-12178
Investigation of the stress corrosion cracking susceptibility of the alloy AlZnMgCu 1.5 with regard to electrochemical and metallurgical aspects
[ESA-TT-336] N77-12186
Fractographic evaluation of fracture specimens
[AD-A025746] N77-12194
Surface analysis of 6061 and 7050 aluminum alloys after conditioning by chemical treatment
[AD-A025736] N77-12200
Fatigue crack growth in aluminum alloys
[AD-A025196] N77-12207
Effects of iron and silicon content on stress corrosion cracking in a thermomechanically processed aluminum alloy
[AD-A025165] N77-12210
Hot pressure welding of aluminum alloys
[AD-A025966] N77-12419
Speckle pattern correlation method for measurement of surface structural changes caused by fatigue
N77-12433
Growth of part-through cracks in simple construction elements
[IFKM-76/1] N77-12439
ALUMINUM BORON COMPOSITES
Advanced V/STOL propeller critical components investigation
[AD-A024663] N77-12063
ALUMINUM COMPOUNDS
Gallium arsenide - gallium alluminum arsenide distributed feedback and distributed Bragg reflector lasers
N77-12384
AMERICIUM 241
Health implications of the risks connected with the use of americium 241 for lightning protection — metabolism and pathological effects, and radioprotection
[ISS-R-75/16] N77-12684
AMINO ACIDS
Unusual five-coordinate complexes of transition metal ions
N77-12172
AMMONIA
Heat pipe materials compatibility
[NASA-CR-135069] N77-12182
Maritime and construction aspects of Ocean Thermal Energy Conversion [OTEC] plant ships
[PB-255639/7] N77-12552
Ammonia toxicity
[PB-256447/4] N77-12577
AMMONIUM CHLORIDES
Interaction of aqueous electrolytes and quaternary ammonium salts
N77-12155
AMPLIFIERS
Development of a speech amplifier system for use with the Navy A4 oxygen breathing apparatus and a proposed firefighting instructor's breathing device
[AD-A025184] N77-12321
AMPLITUDE DISTRIBUTION ANALYSIS
A device for detecting amplitudes of vibration of turbodynamo blades
[NLL-M-24095-[5828.4F]] N77-12360
ANAEROBES
Bonding of elevated temperature strain gages to humid aged graphite tensile specimens through the use of anaerobic adhesives
[AD-A025920] N77-12223
ANALOG SIMULATION
Vortex simulation of the pressure field of a jet
[NASA-TM-X-73984] N77-11989
Alternatives for jet engine control
[NASA-CR-146531] N77-12058
ANALOG TO DIGITAL CONVERTERS
A binary to gray code converter for incorporation in a data modem
[SRDE-76002] N77-12249
ANALYSIS OF VARIANCE
An analysis of the position location and reporting system's performance characteristics
[AD-A025437] N77-12038
ANALYTICAL CHEMISTRY
Analytical applications of a high resolution echelle monochromator
N77-12151
Improving the reliability of factor analysis of chemical data by utilizing the measured analytical uncertainty
[AD-A025951] N77-12169
ANGULAR MOMENTUM
Transfer of angular momentum and condensation of grains
N77-12975
ANGULAR RESOLUTION
A high angular resolution study of the neutral hydrogen in the IrrII galaxy M82
[AD-A024806] N77-12985
ANIMALS
Microwave exposure facility: Multiple animal exposure at equal power density
[AD-A024939] N77-12667
Metabolic rates in five animal populations after long-term exposure to sanguine/sea-farer ELF Electromagnetic fields in nature
[AD-A024955] N77-12668
Experimental study of vision dimming in an animal
N77-12716
ANISOTROPIC MEDIA
Radiational heat exchange between surfaces with anisotropic radiation
[NLL-M-25350-[5828.4F]] N77-12328
ANNEALING
Formation of an impeded recrystallization zone during the annealing of low-alloy molybdenum alloys
[NLL-M-25349-[5828.4F]] N77-12174
ANTENNA ARRAYS
Single channel monopulse converter
[AD-A025485] N77-12117
Multimode phased array tube
[AD-A025691] N77-12316
Development of a superconducting ELF receiving antenna
[AD-A024666] N77-12319
ANTENNA DESIGN
Evaluation of selected space shuttle orbiter antenna systems
N77-12238
A preliminary report on the in-house exploratory development program on microstrip patch antennas at the Naval Surface Weapons Center
[AD-A025304] N77-12256
ANTENNA RADIATION PATTERNS
Time domain radiation fields of a monopole antenna
[AD-A025619] N77-12252
A computer program for radiation from arbitrarily oriented wire antennas over imperfect ground
[AD-A025457] N77-12274
A study of near-field data handling and probe design techniques
[AD-A024990] N77-12283
ANTHROPOMETRY
Sampling and data gathering strategies for future USAF anthropometry
[AD-A025240] N77-12697
Statistical concepts in design
[AD-A025750] N77-12699
ANTIMISSILE DEFENSE
The feasibility of a storable propellant turbine/high-speed alternator as a compact short-life power system for hardened ballistic missile defense [BMD] installations
[AD-A024786] N77-12543
ANTIRADAR COATINGS
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388
ANTIREFLECTION COATINGS
Army preliminary evaluation JOH-58A helicopter with low reflective paint and infrared countermeasure exhaust system
[AD-A024727] N77-12042
Study of surface finishing and coating of DF laser windows
[AD-A025710] N77-12396
Low reflectivity solar cells
[AD-A025922] N77-12539
Solar cell observables reduction techniques
[AD-A025923] N77-12541
APPLICATIONS OF MATHEMATICS
Toward a convergent perturbation theory
N77-12785
Another look at the concept of model
[UCRL-77896] N77-12790
Invariant measures and its applications
N77-12792
Applied mathematics
[AD-A025791] N77-12807
Technique development for complete electronic-structure calculations in crystalline solids
[AD-A025128] N77-12903
APPROACH CONTROL
A parametric analysis of visual approaches for helicopters
[NASA-TN-D-8275] N77-12066
APPROACH INDICATORS
Spectrally balanced chromatic landing approach lighting system
[NASA-CASE-ARC-10990-1] N77-12031
APPROXIMATION
Approximating functions for earth atmospheric density
[NASA-TT-F-17107] N77-12608
Uniform approximation of continuous functions on open subsets of R to the m power
N77-12786
Pearson curves revisited
[AD-A025696] N77-12809
Stochastic approximation with correlated data
[AD-A024279] N77-12819
AQUEOUS SOLUTIONS
Interaction of aqueous electrolytes and quaternary ammonium salts
N77-12155
Catalytic deoxygenation of aqueous solution by hydrazine
[AD-A025794] N77-12233
ARC WELDING
Metallurgical factors controlling weld metal toughness in the seam welding of line pipe
[PB-256057/1] N77-12415
ARCHITECTURE [COMPUTERS]
On-line virtual architecture tuning using microcapture
N77-12741
ARCTIC REGIONS
Digital ionospheric sounding in support of arctic research
[AD-A024706] N77-12630
ARKANSAS
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
ARMED FORCES [UNITED STATES]
The application of design-to-cost acquisition policies to selected electronics subsystem development programs
[AD-A024895] N77-12931
ARROW WINGS
Low-speed wind-tunnel investigation of a large scale advanced arrow-wing supersonic transport configuration with engines mounted above wing for upper-surface blowing
[NASA-TN-D-8350] N77-11997
ARSENIC COMPOUNDS
Structural relaxation of enthalpy and heat capacity of As2Se3 glass
[AD-A025018] N77-12229
ASPHALT
A laboratory evaluation of sulphur-asphalt paving mixtures
[PB-254911/1] N77-12441
ASSEMBLER ROUTINES
An assembler for the MOS Technology 6502 microprocessor as implemented in jolt [TM] and KIM-1 [TM]
[NASA-CR-149227] N77-12030
Task descriptors for automated assembly
[PB-255545/6] N77-12410
PDP-11 macro cross assembler
[AD-A025751] N77-12731
ASTEROIDS
The small bodies
N77-12962
Forces acting on small bodies
N77-12963
Kepler motion of interacting bodies; jet streams
N77-12964

Collisions: Fragmentation and accretion
N77-12965

ASTRONOMICAL MODELS
Model of the hetegonic plasma
N77-12974

ASTRONOMICAL OBSERVATORIES
Automatic magnetic control of a momentum-biased observatory in equatorial orbit
N77-12098

ASYMMETRY
Asymmetrical oscillations in nonlinear systems
[AD-A024673] N77-12320

ASYMPTOTIC METHODS
On asymptotic expansions and error bounds in the derivation of two-dimensional shell theory
[AD-A025677] N77-12452
Asymptotic properties of solutions of the equation y'=f[x]phi[y]
N77-12791
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862

ATMOSPHERES
Computational techniques for the study of infrasound propagation in the atmosphere
[AD-A024951] N77-12836

ATMOSPHERIC ATTENUATION
Propagation of multiwavelength laser radiation through atmospheric turbulence
[AD-A024863] N77-12389

ATMOSPHERIC CLOUD PHYSICS LAB [SPACELAB]
Analyses of ACPL thermal/fluid conditioning system
[NASA-CR-149166] N77-12333

ATMOSPHERIC COMPOSITION
Measurement of gaseous minor constituents in the natural stratosphere --- to predict stratospheric pollution by supersonic aircraft flight
[ESA-TT-337] N77-12615

ATMOSPHERIC CONDUCTIVITY
Effect of sun angle, atmospheric attenuation, and turbulence on mirror beacons for LANDSAT image control
[PB-255404/6] N77-12488

ATMOSPHERIC DENSITY
The effect of various air density-altitude relations on the phugoid
[NASA-TT-F-17118] N77-11990
Approximating functions for earth atmospheric density
[NASA-TT-F-17107] N77-12608

ATMOSPHERIC EFFECTS
Image quality through the atmosphere
N77-12853

ATMOSPHERIC MODELS
Wind power prediction models
[NASA-CR-149235] N77-12509
Air quality models required data characterization
[PB-255730/4] N77-12589
PECHCV, PECHFV, PEFHCV and PEFHFV: A set of atmospheric, primitive equation forecast models for the Northern Hemisphere, volume 3
[NASA-CR-149027] N77-12637
Turbulent atmospheric flow over a backward-facing step
[NASA-CR-2749] N77-12639
Data Assimilation Restorative-Iterative Model [RIMOD]
[AD-A024736] N77-12654

ATMOSPHERIC MOISTURE
Influence of air humidity on compressor and turbine efficiency determined from experimental data
[NASA-TT-F-17073] N77-12057

ATMOSPHERIC PHYSICS
SOVRAD: A digest of recent Soviet R and D articles, volume 2, number 3, 1976
[AD-A025814] N77-12994

ATMOSPHERIC REFRACTION
Method of computing the influence of spherically laminar inhomogeneities on tropospheric refraction and contribution to the radio refraction of mists, cloudiness and rain
N77-12242

ATMOSPHERIC TURBULENCE
A method for the analysis of nonlinearities in aircraft dynamic response to atmospheric turbulence
[NASA-TN-D-8265] N77-11992
Propagation of multiwavelength laser radiation through atmospheric turbulence
[AD-A024863] N77-12389
An investigation of the degradation of a laser beam by high intensity turbulence
[AD-A025658] N77-12398
An assessment of prewhitening in estimating power spectra of atmospheric turbulence at long wavelengths
[NASA-TN-D-8288] N77-12610
Distortion of weak shock and sound waves by atmospheric turbulence
[ESA-TT-355] N77-12616
Turbulent atmospheric flow over a backward-facing step
[NASA-CR-2749] N77-12639
National several local storms operation plan
[PB-256717/0] N77-12658
Imagery utilizing multiple focal planes
N77-12852-

ATOMIC COLLISIONS
Contribution to Frenkel condensation theory
N77-12899

ATOMIC ENERGY LEVELS
Investigations into new methods of analysis by atomic and molecular fluorescence and flame emission
N77-12150
Resonance lines and energy levels of Cs3, Ba4, and La5
[NASA-CR-149207] N77-12844

ATOMIC EXCITATIONS
Measurement of excitation functions for charged particle reactions with gases
N77-12875

ATOMIC SPECTRA
Studies into tunable-laser-excited atomic fluorescence spectrometry
N77-12381

ATOMIC STRUCTURE
Axial effects in planar complexes: Iron tetraphenylporphyrinrin and nickel bisdiphenylglyoxime halides
N77-12890
Technique development for complete electronic-structure calculations in crystalline solids
[AD-A025128] N77-12903

ATOMIZING
The determination of trace amounts of aluminium, bismuth, chromium and antimony in steels by flameless atomic absorption spectrophotometry
[PB-256053/0] N77-12204

ATTENUATION COEFFICIENTS
Spectral effects on cross-sectional reconstruction from X-rays
N77-12855

ATTITUDE CONTROL
Controllers and autopilot modes for RPV simulation program
[AD-A025792] N77-12051

ATTITUDE GYROS
Ring Laser Attitude System
[AD-A025769] N77-12390

ATTITUDE STABILITY
Passive attitude stabilization of satellites --- magnetic and gravity gradient methods
[VTH-176] N77-12100

AUDITORY PERCEPTION
The response to sound of identified reticulo-spinal cells
N77-12677
The effect of auditory and visual presentation of navigational messages on message retention
[PB-256599/2] N77-12706

AURORAL ZONES
A region of intense plasma wave turbulence on auroral field lines
[NASA-CR-149209] N77-12620

AUSTENITE
Segregation effects and the toughness of high-strength steels
[AD-A025299] N77-12190

AUTOMATIC CONTROL
Automatic control of a transonic wind tunnel with a real-time computer system
N77-11977
Task descriptors for automated assembly
[PB-255545/6] N77-12410
Automatic meteorological observations in Northern Greenland
[P-62] N77-12642
Personal rapid transit research conducted at the Aerospace Corporation
[PB-256846/7] N77-12946

AUTOMATIC LANDING CONTROL
Generalization and refinement of an automatic landing system capable of curved trajectories
[NASA-TN-D-8336] N77-12032

AUTOMATIC PILOTS
Controllers and autopilot modes for RPV simulation program
[AD-A025792] N77-12051
Pilot interaction with automated airborne decision making systems
N77-12695

AUTOMOBILE ENGINES
Emissions and performance of catalysts for gas turbine catalytic combustors
[NASA-TM-X-73543] N77-12406
Increased fuel economy in transportation systems by use of energy management: Second year's program. Executive summary
[PB-256117/3] N77-12536

AUTOMOBILE FUELS
Impacts of synthetic liquid fuel development. Automotive market. Volume 1: Summary
[PB-255994/6] N77-12533
Impacts of synthetic liquid fuel development. Automotive market. Volume 2
[PB-255995/3] N77-12534

AUXILIARY POWER SOURCES
Auxiliary power system for activity cooled aircraft
[NASA-CASE-LAR-11626-1] N77-12332

AVIONICS
A comparison of distributed control and command/response multiplex systems
[AD-A025105] N77-12264

AXIAL FLOW TURBINES
Through-flow calculations in axial turbomachinery
[AGARD-CP-195] N77-12013
Models for calculating flow in axial turbomachinery
N77-12014
Through-flow calculations in axial turbomachinery: A technical point of view
N77-12015
Design of turbine, using distributed or average losses; effect of blowing
N77-12021
A critical review of turbine flow calculation procedures
N77-12022
Compressor design and experimental results
N77-12023
Turbines: Presentation of calculated data and comparison with experiments
N77-12026

AXIAL STRESS
Fatigue under combined out of phase multiaxial stresses --- for carbon steel
N77-12431

AXISYMMETRIC BODIES
On the simulation of an underexpanded propulsive jet for the investigation of the static longitudinal stability of an axially symmetric flight vehicle in supersonic flow
[ESA-TT-334] N77-12004
A study of the drag characteristics and polymer diffusion in the boundary layer of an axisymmetric body
[AD-A024667] N77-12227

AXISYMMETRIC FLOW
Finite element method for through-flow calculations
N77-12018

B

B-1 AIRCRAFT
Adjoint Monte Carlo generated radiation response functions for the B-1 aircraft
[AD-A025756] N77-12687

BACKGROUND NOISE
The effect of continuous noise on short term memory performance tasks
[AD-A025446] N77-12694

BACKGROUND RADIATION
A detector test for low background measurement
[ISS-T-75/11] N77-12991

BACKSCATTERING
Tracker backscatter study
[AD-A025768] N77-12391

BAFFLES
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158

BAINITE
Literature review: Impact toughness of bainite versus martensite
[AD-A025858] N77-12189

BALANCE
Aircraft tires: Balance pad bonding integrity
[AD-A024815] N77-12413

BALL BEARINGS
Evaluation techniques for ball bearings using a high speed test bench
[LRBA-E-602-NT-42/SIE] N77-12407
Ball bearings for gyroscope axis. Simple movements of the retainer
[LRBA-E-602-NT-49/SIE] N77-12408
Ceramic airframe bearings
[AD-A025142] N77-12420

BAND STRUCTURE OF SOLIDS
Symposium on the Fundamental Optical Properties of Solids Relevant to Solar Energy Conversion
[PB-256615/6] N77-12538
Technique development for complete electronic-structure calculations in crystalline solids
[AD-A025128] N77-12903

BANDPASS FILTERS
Follow-up filter
[CEPHAG-23/75] N77-12299

BARENTS SEA
Remote sensing of variations of sea-ice-surfaces in the Barents-Sea from 1966 - 1975 by means of satellite data, among others NOAA-VHRR
N77-12484

BARIUM
Resonance lines and energy levels of Cs3, Ba4, and La5
[NASA-CR-149207] N77-12844

BARIUM COMPOUNDS
Measurement of atmospheric sulfates: Literature search and methods selection
[PB-254387/4] N77-12562

BARRIERS
Research, design, and development of the U.S. Coast Guard high seas oil containment system
[AD-A025749] N77-12573

BASE FLOW
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs
[PB-256564/6] N77-12939
BATTERY CHARGERS
Method and apparatus for reconditioning nickel-cadmium batteries
[NASA-CASE-MFS-23270-1] N77-12511
BAYES THEOREM
Applications of generalized spline functions to empirical Bayes estimation
N77-12814
Exact and approximate Bayesian solutions for inference about variance components and multivariate inadmissibility
[AD-A025452] N77-12824
BEAM SPLITTERS
Low efficiency diffraction grating theory
[AD-A024804] N77-12866
BEAM SWITCHING
How to switch a beam-forming network with minimum disturbance to existing communication channels
[AD-A025208] N77-12302
BEAMS [SUPPORTS]
Durability and behavior of prestressed concrete beams. Report 5: Laboratory tests of weathered pretensioned beams
[AD-A025694] N77-12462
BEAUFORT SEA [NORTH AMERICA]
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473
BERYLLIUM
Fabrication and evaluation of hot isostatically pressed beryllium
[AD-A024780] N77-12198
BERYLLIUM ALLOYS
Effect of inclusions on the mechanical behavior of beryllium
[AD-A025968] N77-12209
BERYLLIUM COMPOUNDS
Molecular orbital studies of electron deficient compounds
N77-12837
BIBLIOGRAPHIES
Aeronautical Engineering: A special bibliography with indexes, supplement 74 --- Aerospace Medicine and Biology bibliography, supplement [74], September 1976
[NASA-SP-7037[74]] N77-11967
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387
Quarterly literature review of the remote sensing of natural resources, third quarter 1976 --- bibliography
[NASA-CR-149163] N77-12470
Energy: A continuing bibliography with indexes
[NASA-SP-7043[10]] N77-12505
Bibliography of Soviet Material on Internal Waves, no. 6, November 1975 - April 1976
[AD-A025813] N77-12664
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 159
[NASA-SP-7011[159]] N77-12670
Information on the metric system and related fields
[NASA-TM-X-3449] N77-12992
BIOCHEMISTRY
Elastic and quasi-elastic laser light scattering of photochromic macromolecules
N77-12383
BIODYNAMICS
Topology in biology, the relationship of structure to function
N77-12666
BIOENGINEERING
Topology in biology, the relationship of structure to function
N77-12666
BIOGRAPHY
Max Valier: A pioneer of space travel
[NASA-TT-F-664] N77-12993
BIOINSTRUMENTATION
Effects of the physiological environment on the long-term physical performance of polymeric materials
[NASA-CR-149206] N77-12220
BIOLOGICAL EFFECTS
Aeronautical Engineering: A special bibliography with indexes, supplement 74 --- Aerospace Medicine and Biology bibliography, supplement [74], September 1976
[NASA-SP-7037[74]] N77-11967
Priorities in air pollution source control: Modeling of population exposures and health effects
N77-12558
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 159
[NASA-SP-7011[159]] N77-12670
BIOMEDICAL DATA
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 159
[NASA-SP-7011[159]] N77-12670
BIOTELEMETRY
Biomedical technical transfer. Applications of NASA science and technology
[NASA-CR-149161] N77-12935
BIPOLAR TRANSISTORS
Advanced integrated-circuit technology for micropower ICs. Integrated circuits
[AD-A025507] N77-12303
BIRD-AIRCRAFT COLLISIONS
Eye protection, protective devices and visual aids
N77-12709
BITUMENS
Evaluation of temperature effects on bituminous pavement deflections in Virginia
[PB-255955/7] N77-12456
BIVARIATE ANALYSIS
Square-root ratio estimation
[AD-A025241] N77-12802
BLACK AND WHITE PHOTOGRAPHY
Photographic emulsion threshold functions study
[AD-A025471] N77-12374
BLAST LOADS
Ignition phase blast field of tube or silo launched rockets: Inviscid, chemically reacting flow model
[AD-A025198] N77-12106
Blast pressures inside and outside suppressive structures
[AD-A025504] N77-12447
Methods of predicting blast loads inside and outside suppressive structures
[AD-A024906] N77-12466
BLOOD
Electron spin resonance of lyophilized blood sample --- for cancer diagnosis
[ISS-P-75/17] N77-12685
BLOWING
Effects of upper-surface blowing and thrust vectoring on low speed aerodynamic characteristics of a large-scale supersonic transport model
[NASA-TN-D-8296] N77-12065
BLUE GREEN ALGAE
Improving water quality by control of algae: Cellular and extracellular blue-green algal polysaccharides
[PB-254614/1] N77-12563
BLUFF BODIES
Atmospheric flow over two-dimensional bluff surface obstructions
[NASA-CR-2750] N77-11996
BOATTAILS
Investigation of very low blockage ratio boattail models in the Langley 16-foot transonic tunnel
[NASA-TN-D-8335] N77-11998
BODIES OF REVOLUTION
Investigation of jet plume effects on the longitudinal stability characteristics of a body of revolution with various fin configurations at Mach numbers from 0.2 to 2.3 [normal jet plume simulator]
[AD-A024978] N77-12006
BODY FLUIDS
The collection, analysis, and comparison of human sensible perspiration between sedentary and conditioned male caucasians as to the variation in selected electrolyte composition
N77-12669
BOILERS
Assessment of the impact of proposed thermal effluent guidelines for the steam electric power industry
[PB-255937/5] N77-12587
BONDING
Aircraft tires: Balance pad bonding integrity
[AD-A024815] N77-12413
BORATES
Processing FeB03 glass-ceramics in space
[NASA-CR-150068] N77-12084
BORIDES
Development of erosion resistant claddings for helicopter rotor blades
[AD-A024894] N77-12054
BORN APPROXIMATION
Toward a convergent perturbation theory
N77-12785
BORON
Analysis of carrier concentration and mobility in boron-doped silicon
N77-12886
BORON COMPOUNDS
Molecular orbital studies of electron deficient compounds
N77-12837
BORON REINFORCED MATERIALS
Interlaminar strength of laminated polymeric matrix composites
[AD-A024722] N77-12138
BORON-EPOXY COMPOUNDS
Fatigue of notched fiber composite laminates. Part 2: Analytical and experimental evaluation
[NASA-CR-145039] N77-12133
Boron-epoxy-reinforced titanium aircraft landing-gear drag strut
[NASA-TN-D-8289] N77-12218
BOROSILICATE GLASS
Investigation of piezoelectric effect in permanently polarized oxide glasses and glass-ceramics
[AD-A025144] N77-12325
BOTANY
Paleobiology and paleoecology of middle Cambrian algae from western North America
N77-12604
BOUNDARY LAYER EQUATIONS
Jet impingement of a curved surface
N77-12334
BOUNDARY LAYER FLOW
Investigation of boundary layer-like flows with pressure gradients at high freestream Mach numbers
[ESA-TT-348] N77-12338
A study of boundary layer and mass bleed in a short length supersonic diffuser for a gas dynamic laser
[AD-A025673] N77-12394
BOUNDARY LAYER SEPARATION
Flow-induced vibrations resulting from Karman vortex trails
[BLL-RISLEY-TR-2994-[9091.9F]]
N77-11988
Supersonic aircraft after body study of a thick boundary layer on a two-dimensional step
[LRBA-E-815-PV-4/SAE] N77-12001
BOUNDARY LAYER TRANSITION
Fourier analysis and the correlation of speed with nonstationary aerodynamics
N77-11985
BOUNDARY LAYERS
A study of the drag characteristics and polymer diffusion in the boundary layer of an axisymmetric body
[AD-A024667] N77-12227
BOUNDARY VALUE PROBLEMS
Finite deformation of elastic-plastic and elastic/viscoplastic continua
N77-12429
Bounds for effective elastic moduli of disordered materials. Part 1: Formal theory
N77-12438
On asymptotic expansions and error bounds in the derivation of two-dimensional shell theory
[AD-A025677] N77-12452
Methods for solving the viscoelasticity equations for cylinder and sphere problems
[AD-A025302] N77-12800
BOW WAVES
Aerodynamic coefficients and position of the bow shock wave of circular cones with pointed and spherically blunted noses in supersonic flow
[ESA-TT-335] N77-12005
BRAIN
Neurophysiology and road safety: Contribution of the frontal lobes to visual orienting
N77-12672
Clearance and saturation of hydrogen gas in man with special emphasis on the brain
[AD-A025952] N77-12692
BRAKES [FOR ARRESTING MOTION]
Generalization and refinement of an automatic landing system capable of curved trajectories
[NASA-TN-D-8336] N77-12032
BREADBOARD MODELS
Low loss low hold power diode phase shifter development
[AD-A024779] N77-12312
BROADCASTING
A follow-on study on crossed-field amplifiers for TVBS mission --- television broadcasting satellite
[HR1084] N77-12251
BROMIDES
Measured performance of a 3 ton LiBr absorption water chiller and its effect on cooling system operation
[NASA-TM-X-73496] N77-12518
BUCKLING
SPHERE, a program for computing buckling loads of spherical shells under uniform pressure
[AD-A025012] N77-12467
BUILDINGS
Application of building climatology to the problems of housing and building for human settlements
[WMO-441] N77-12640
BUTANES
Petroleum market shares. Report on sales of propane to ultimate consumers, 1975
[PB-255624/9] N77-12540

C

CADMIUM SULFIDES
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
Assessment of cadmium sulfide photovoltaic arrays for large scale electric utility applications
[PB-255646/2] N77-12551
CADMIUM TELLURIDES
Study of the effects of radiation on the electrical and optical properties of HgCdTe
[AD-A025222] N77-12257
CALCULUS OF VARIATIONS
Variational calculations with hyperspherical basis sets on atomic helium and lithium
N77-12839

CALIBRATING
Assembling of the range partials into the range word in the ACMI system
[AD-A024770] N77-12287
Spectral sensitivity calibration of spectrophotometers — using standard tungsten quartz lamp
[AML-R7602] N77-12370
CALIFORNIA
California trials with Lean Concrete Base [LCB]
[PB-254035/9] N77-12443
Wind power prediction models
[NASA-CR-149235] N77-12509
California energy outlook
[UCRL-5196-REV-1] N77-12525
Self-regulation of environmental quality: Impact analysis in California local government
[PB-254450/0] N77-12566
Temperature effects of crude oil in the upper intertidal zone
[PB-255956/5] N77-12581
CAMERA TUBES
Storage camera tube with non-destructive readout
[AD-A024280] N77-12301
CANCER
Electron spin resonance of lyophilized blood sample — for cancer diagnosis
[ISS-P-75/17] N77-12685
CANTILEVER BEAMS
Optimum support damping for a vibrating beam
[AD-A025106] N77-12446
On stretching, bending, twisting and flexure of cylindrical shells
[AD-A025676] N77-12453
CARBON
Zonal energetics balances for the melting of carbon ferrochromium
[NLL-M-25334-[5828.4F]] N77-12176
CARBON COMPOUNDS
Determination of the torsional barriers around single bonds by vibrational spectroscopy
N77-12153
CARBON DIOXIDE
The spectral characteristics and atmospheric CO2 absorption of the Ho[+]3: YLF laser at 2.05 micrometers
[AD-A025618] N77-12386
CARBON DIOXIDE LASERS
Visible wavelength chemiluminescence initiated by CO2 laser radiation
[AD-A025002] N77-12170
SOVRAD: A digest of recent Soviet R and D articles, volume 2, number 3, 1976
[AD-A025814] N77-12994
CARBON FIBER REINFORCED PLASTICS
Study of processing and properties of graphite fiber/high temperature resin composites
[AD-A024733] N77-12141
CARBON MONOXIDE
Mechanism of photochemically initiated oxidations
[PB-256397/1] N77-12575
CARBON MONOXIDE LASERS
CO chain-reaction chemical laser research
[AD-A024719] N77-12393
CARBON STEELS
Fatigue under combined out of phase multiaxial stresses — for carbon steel
N77-12431
CARGO
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 1: Text
[PB-256822/8] N77-12729
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 2: Appendixes
[PB-256823/6] N77-12730
CASCADE FLOW
Analysis of supersonic unsteady cascades with the method of characteristics, volume 1
[AD-A025909] N77-12342
CATALYSIS
The electron factor in catalysis on metals electrocatalysis on non-metallic surfaces
[PB-256264/3] N77-12166
Catalytic deoxygenation of aqueous solution by hydrazine
[AD-A025794] N77-12233
CATALYSTS
Emissions and performance of catalysts for gas turbine catalytic combustors
[NASA-TM-X-73543] N77-12406
Optimization of PT-doped Kocite [trademark] electrodes in H3 PO4 fuel cells
[AD-A025326] N77-12529
CATHODES
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy
N77-12178
CELLULOSE NITRATE
Analysis and characterization of high purity talc for use in propellants; determination of talic in propellants
[AD-A025122] N77-12234
CENSUS
CENTS-AID II programmer's notebook
[PB-256475/5] N77-12761
CERAMIC COATINGS
Development of sputtered high temperature coatings for thrust chambers
[NASA-CR-135097] N77-12181
Ceramic airframe bearings
[AD-A025142] N77-12420
CERAMICS
Processing FeB03 glass-ceramics in space
[NASA-CR-150068] N77-12084
Electrical properties of polycrystalline ceramic insulators
[AD-A025312] N77-12221
Investigation of piezoelectric effect in permanently polarized oxide glasses and glass-ceramics
[AD-A025144] N77-12325
CESIUM
Resonance lines and energy levels of Cs3, Ba4, and La5
[NASA-CR-149207] N77-12844
CH-47 HELICOPTER
Full-scale crash test of a CH-47C helicopter
[NASA-TM-X-3412] N77-12027
CHALCOGENIDES
Optical studies of bonding in solids
[AD-A024949] N77-12909
CHANNEL FLOW
The numerical solution of the steady flow of Newtonian and non-Newtonian fluids through a contraction
[AD/A025774] N77-12344
CHANNELS [DATA TRANSMISSION]
How to switch a beam-forming network with minimum disturbance to existing communication channels
[AD-A025208] N77-12302
Data bus network simulation
[AD-A025115] N77-12772
CHARACTER RECOGNITION
The use of context in character recognition
N77-12744
CHARGE CARRIERS
The role of charge transport in the formation and erasure of volume phase holograms in electrooptic lithium niobate
N77-12359
Analysis of carrier concentration and mobility in boron-doped silicon
N77-12886
CHARGE TRANSFER
Charge transport and the photorefractive effect in doped and undoped lithium tantalate
N77-12358
CHARGED PARTICLES
Measurement of excitation functions for charged particle reactions with gases
N77-12875
Charged-particle absorption by Io
[NASA-CR-149162] N77-12989
CHEMICAL ANALYSIS
Surface analysis of 6061 and 7050 aluminum alloys after conditioning by chemical treatment
[AD-A025736] N77-12200
Fuel contaminants. Volume 1: Chemistry
[PB-256020/9] N77-12231
Analysis and characterization of high purity talc for use in propellants; determination of talic in propellants
[AD-A025122] N77-12234
CHEMICAL BONDS
The clustering of O2 and He to Li[+]
[AD-A025762] N77-12625
Optical studies of bonding in solids
[AD-A024949] N77-12909
CHEMICAL COMPOSITION
Chemical structure of the solar system
N77-12978
Mass distribution and the critical velocity
N77-12979
Jupiter and Saturn. Giants of the solar system
[NASA-TT-F-17274] N77-12986
CHEMICAL LASERS
A search for chemical laser action in low pressure metal vapor flames
N77-12380
Far-infrared, chemical water lasers — produced by flash photolysis
N77-12382
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387
CO chain-reaction chemical laser research
[AD-A024719] N77-12393
CHEMICAL REACTIONS
Unusual five-coordinate complexes of transition metal ions
N77-12172
Interactions of water with hydrophilic polyether polyurethanes
N77-12214
Measurement of excitation functions for charged particle reactions with gases
N77-12875
CHEMICAL REACTORS
Chemical vapor deposition growth
[NASA-CR-149233] N77-12516
CHEMILUMINESCENCE
Visible wavelength chemiluminescence initiated by CO2 laser radiation
[AD-A025002] N77-12170
CHLORIDES
Chloride management in Lake Erie Basin
[PB-256241/1] N77-12584
CHROMATOGRAPHY
Matrix affinity chromatography and its application to the concentration and separation of trace organics in water
N77-12148
CHROMIUM
Zonal energetics balances for the melting of carbon ferrochromium
[NLL-M-25334-[5828.4F]] N77-12176
CHROMIUM ALLOYS
Effect of a chromium-containing fuel additive on hot corrosion
[NASA-TM-X-73465] N77-12184
CHRONOLOGY
Reconstruction of past climatic variability
[AD-A024276] N77-12647
CIRCUITS
Electronic components: A survey of the most used component types, their characteristic data, applications and failure rates
[ECR-62] N77-12293
CIRCULAR CONES
Aerodynamic coefficients and position of the bow shock wave of circular cones with pointed and spherically blunted noses in supersonic flow
[ESA-TT-335] N77-12005
CIRCULAR CYLINDERS
Numerical investigations of monopole antenna systems on conducting cylinders — satellite antennas
[R-166] N77-12250
CIRCULATION
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832
CITIES
Growth effects of major land use projects. Volume 3: Summary
[PB-256204/9] N77-12583
Systematic development of methodologies in planning urban water resources for medium size communities phase 1
[PB-256565/3] N77-12940
CLADDING
Development of erosion resistant claddings for helicopter rotor blades
[AD-A024894] N77-12054
CLASSIFICATIONS
Classification rules for exponential populations: Two parameter case
[AD-A025181] N77-12811
Classification techniques appropriate for unequal covariance matrices
N77-12815
CLEANING
UV/ozone cleaning of surfaces
[AD-A024943] N77-12313
CLIMATE
Reconstruction of past climatic variability
[AD-A024276] N77-12647
CLIMATOLOGY
Application of building climatology to the problems of housing and building for human settlements
[WMO-441] N77-12640
CLINICAL MEDICINE
A three phase model for controlled clinical trials
N77-12817
CLOCKS
Maximal clocking rates for pipelined digital systems
[AD-A025611] N77-12726
CLOUD COVER
The radiation and energy budgets of the earth using both ground-based and satellite-derived values of total cloud cover
[PB-256756/8] N77-12632
CLOUD PHYSICS
Review study and evaluation of possible flight experiments relating to cloud physics experiments in space
[NASA-CR-150066] N77-12638
CLOUDS
Aircraft ionizing doses and dose rates from radioactive clouds and fallout
[AD-A024896] N77-12053
CLOUDS [METEOROLOGY]
Method of computing the influence of spherically laminar inhomogeneities on tropospheric refraction and contribution to the radio refraction of mists, cloudiness and rain
N77-12242
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862
CLUMPS
The clustering of O2 and He to Li[+]
[AD-A025762] N77-12625

The development and Monte Carlo investigation of non-hierarchical clustering procedure, and its application to discrimination problems in industrial administration
N77-12812

COAL
An application of ERTS technology to the evaluation of coal strip mining and reclamation in the northern Great Plains
[NASA-CR-149208] N77-12486
Laws and regulations affecting coal with summaries of Federal, State, and local laws and regulations pertaining to air and water pollution control, reclamation, diligence and health and safety, part 1
[PB-255927/6] N77-12592
Laboratory analysis of solvent refined coal
[PB-255550/6] N77-12598

COAL GASIFICATION
Preliminary economics and comment: In-situ gasification of coal for power and SNG
[PB-256034/0] N77-12554
Outlook for research and development in the underground gasification of coal
[PB-256155/3] N77-12555

COAL LIQUEFACTION
Synthesis and analysis of jet fuel from shale oil and coal syncrudes
[NASA-CR-135112] N77-12230
Fuel contaminants. Volume 1: Chemistry
[PB-256020/9] N77-12231

COAL UTILIZATION
Implementing coal utilization provisions of Energy Supply and Environmental Coordination Act
[PB-255855/9] N77-12549

COASTS
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473

COATINGS
Development of sputtered high temperature coatings for thrust chambers
[NASA-CR-135097] N77-12181
Coating science and technology --- laser optical films
[AD-A025487] N77-12411

COBALT COMPOUNDS
Growth of single crystals of some rare-earth-cobalt compounds R2Co17, from the melt
[AD-A025141] N77-12913

COCKPIT SIMULATORS
Flight simulator evaluation of an electronic paravisual guidance indicator
[ESA-TT-350] N77-12056
Test plot evaluation of a reclined cockpit seat as an aid to G tolerance and performance
[AD-A025784] N77-12703

CODING
The role of coding in multiple-access satellite communication systems
[AD-A025612] N77-12116
Differential pulse code modulation
[NASA-CASE-MSC-12506-1] N77-12239
Encoding reduction and classification of two-dimensional data by factor analysis techniques
N77-12738
An evaluation and comparison of three nonlinear programming codes
[AD-A024930] N77-12763

COEFFICIENTS
A guide to the Burr Type XII distributions
[AD-A025242] N77-12803

COHERENT RADAR
Coherent Optical Adaptive Techniques (COAT)
[AD-A025668] N77-12280
Coherent Optical Adaptive Techniques (COAT)
[AD-A025669] N77-12395

COHERENT SCATTERING
Application of coherent anti-Stokes Raman scattering to measurements of gas concentrations in aerodynamic flows
[ESA-TT-331] N77-12160

COLD PLASMAS
The cold plasma throughout the magnetosphere --- observed by Prognoz satellites
[D-230] N77-12612

COLLOCATION
Finite least squares collocation method
N77-12782

COLLOIDING
Electron spin resonance of lyophilized blood sample --- for cancer diagnosis
[ISS-P-75/17] N77-12685

COLOMBIA
History of earthquakes in Colombia
N77-12607

COLOR PHOTOGRAPHY
CPA color reversal study --- color film processing enhancement
[AD-A025899] N77-12373

COLOR VISION
Color inputs to orientation detectors in the human visual system
N77-12673
Digital color image processing and psychophysics within the framework of a human visual model
N77-12849

COLORADO
Performance measurements over long line-of-sight microwave links in Colorado
[PB-256261/9] N77-12266

COLUMNS (PROCESS ENGINEERING)
Preparative high performance liquid chromatography
N77-12156

COMBINATORIAL ANALYSIS
Worst-case analysis of a new heuristic for the travelling salesman problem
[AD-A025602] N77-12799

COMBUSTION EFFICIENCY
Emissions and performance of catalysts for gas turbine catalytic combustors
[NASA-TM-X-73543] N77-12406

COMBUSTION PRODUCTS
Evaluation of SO2 emission control technology applicable to the East Helena lead smelter
[PB-255277/6] N77-12580
Compliance status of major air pollution facilities
[PB-256653/7] N77-12588

COMBUSTION STABILITY
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158

COMBUSTION VIBRATION
Flow-induced vibrations resulting from Karman vortex trails
[BLL-RISLEY-TR-2994-[9091.9F]]
N77-11988

COMETS
The small bodies
N77-12962
Forces acting on small bodies
N77-12963
Relations between comets and meteoroids
N77-12972

COMMAND AND CONTROL
A comparison of distributed control and command/response multiplex systems
[AD-A025105] N77-12264
Mobile terminal access to the advanced command-control architectural testbed
[AD-A025818] N77-12281
Research and Development Management Analysis System [RDMAS]
[AD-A025447] N77-12920

COMMITTEE ON SPACE RESEARCH
French space program. Report to COSPAR --- covering mid-1975 to mid-1976 period
N77-12086

COMMUNICATION EQUIPMENT
General operations program Signe 3
[NASA-TT-F-16760] N77-12096
Electromagnetic radiation system [EMRS] for susceptibility testing
[AD-A025243] N77-12259

COMMUNICATION SATELLITES
On-orbit and in-plant satellite storage
[AD-A025902] N77-12105
A follow-on study on crossed-field amplifiers for TVBS mission --- television broadcasting satellite
[HR1084] N77-12251
University College London ARPANET project
[AD-A025293] N77-12253

COMMUNITIES
Economic evaluation methods in community planning
[PB-253432/9] N77-12936
Systematic development of methodologies in planning urban water resources for medium size communities: Population characteristics and residential water use
[PB-256566/1] N77-12941

COMPARATORS
A new photogrammetric comparator design
[AD-A025977] N77-12503

COMPARISON
Comparative analysis of designs and implementations of reaction flying vehicles proposed during the nineteenth and beginning of the twentieth centuries
[NASA-TT-F-16749] N77-12081
An evaluation and comparison of three nonlinear programming codes
[AD-A024930] N77-12763

COMPATIBILITY
Heat pipe materials compatibility
[NASA-CR-135069] N77-12182

COMPILERS
FENIX: The LRLTRAN compiler for the STAR
[UCID-30128] N77-12722
An approach to global register allocation
[AD-A024966] N77-12735

COMPLEMENT
Reliability evaluation of C/MOS technology in complex integrated circuits
[AD-A024918] N77-12911

COMPLEX VARIABLES
The singular surface in the parameter space; applications
[AD-A024909] N77-12764

COMPONENTS
Electronic components: A survey of the most used component types, their characteristic data, applications and failure rates
[ECR-62] N77-12293

COMPOSITE MATERIALS
Advanced composite rudders for DC-10 aircraft: Design, manufacturing, and ground tests
[NASA-CR-145068] N77-12039
Evaluation of insulation materials for advanced motor systems
[AD-A025306] N77-12124
The effect of adhesive layer on crack propagation in laminates
N77-12132
Dynamic behavior of laminated polymeric matrix composites
[AD-A025622] N77-12135
Wave propagations in orthogonally reinforced fiber composites. A discrete model for reinforced composites viewed as polar media
[AD-A025596] N77-12136
Thermomechanics of fiber-reinforced composites
[AD-A024948] N77-12140
The thermal conductivity of metal-power/epoxy-resin composites
[AD-A024963] N77-12143
Preliminary evaluation of ATQ polymer as a potential matrix resin
[AD-A025897] N77-12222
Dynamic response of anisotropic laminated plates under initial stress to impact of a mass
[AD-A025906] N77-12445

COMPOSITE STRUCTURES
Effect of low velocity impact damage on the compressive strength of graphite/epoxy hat-stiffened panels
[NASA-TM-X-73988] N77-12134

COMPOUNDING
Metals mining and milling process profiles with environmental aspects
[PB-256394/8] N77-12501

COMPRESSIBILITY
Equilibrium compositions and compressibility factors for air in the temperature range 1500 to 13000 Kelvin and for densities from 0.000001 to 1000 times standard density
[AD-A025449] N77-12916

COMPRESSION LOADS
Optimum compression ratios of Stirling cycle machines
[REPT-68] N77-12405

COMPRESSOR BLADES
Dynamic behavior of laminated polymeric matrix composites
[AD-A025622] N77-12135
Transonic two-dimensional flow analysis of compressor cascade with splitter vanes
[AD-A025921] N77-12347

COMPRESSOR EFFICIENCY
Influence of air humidity on compressor and turbine efficiency determined from experimental data
[NASA-TT-F-17073] N77-12057

COMPUTATION
A universal impedance for soils
[AD-A025759] N77-12624
Notes on the computation of the generalized zeta and digamma functions with programs and tables
[AD-A025134] N77-12707

COMPUTER COMPONENTS
Disk drive interface characteristics
[PB-256440/9] N77-12737

COMPUTER DESIGN
Parallel arithmetic using serial arithmetic processors
N77-12783

COMPUTER GRAPHICS
Computer-produced faces as an iconic display for complex data
N77-12720
A visual display system for the HP 2100A computer
[R-1-76] N77-12723
Graphic display unit for the IBM 7040 computer of the Higher Institute of Health
[ISS-T-75/2] N77-12724
Implementation of interactive graphics display in a multiprogramming environment
[AD-A025681] N77-12733

COMPUTER INFORMATION SECURITY
Protection of information when using microfilm
[NLL-M-24128-[5828.4F]] N77-12922
Lay-out of information of microfilm
[NLL-M-24127-[5828.4F]] N77-12923

COMPUTER NETWORKS
University College London ARPANET project
[AD-A025293] N77-12253
Interprocess communication protocols for computer networks
[AD-A025508] N77-12254
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 1: Text
[PB-256822/8] N77-12729
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 2: Appendixes
[PB-256823/6] N77-12730
Distributed computation study
[AD-A024670] N77-12774

COMPUTER PROGRAMMING
Demonstration program for Omega receiver prototype microcomputer data processing
[NASA-CR-149226] N77-12029
Software sneak circuit analysis
[AD-A024718] N77-12310
Field spectrometer [S191H] preprocessor tape quality test program design document
[NASA-CR-151110] N77-12364
An algorithm for the analysis of reconnaissance imagery
[AD-A025964] N77-12487
Covariance expressions for second and lower order derivatives of the anomalous potential
[AD-A024720] N77-12626
PDP-11 macro cross assembler
[AD-A025751] N77-12731
Disease information system
[AD-A025477] N77-12732
Mask pattern generation techniques --- in computer programming
N77-12745
Space-time trade-offs in structured programming
[AD-A025599] N77-12748
Reasoning from incomplete knowledge in a procedural deduction system
[AD-A024971] N77-12750
The singular surface in the parameter space; applications
[AD-A024909] N77-12764
Parallel arithmetic using serial arithmetic processors
N77-12783
Representations of unbounded optimizations as integer programs
[AD-A025603] N77-12798

COMPUTER PROGRAMS
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
User's manual: Supersonic unsteady cascade program, volume 2
[AD-A025186] N77-12012
A new capability for predicting helicopter rotor noise in hover and in flight
[NASA-CR-147138] N77-12064
FORTRAN programs for the determination of aerodynamic derivatives from transient longitudinal or lateral responses of aircraft
[ARC-CP-1344] N77-12067
Evaluation of selected space shuttle orbiter antenna systems
N77-12238
ARPA internetwork protocols project
[AD-A024819] N77-12261
Multiple Target Instrumentation Radar [MTIR] study, phase 2, add-on
[AD-A025939] N77-12272
A computer program for radiation from arbitrarily oriented wire antennas over imperfect ground
[AD-A025457] N77-12274
SPHERE, a program for computing buckling loads of spherical shells under uniform pressure
[AD-A025012] N77-12467
Planning models for the assessment of advanced energy storage systems
N77-12504
Lightning strike warnings for tethered balloon operations
[AD-A025486] N77-12649
Notes on the computation of the generalized zeta and digamma functions with programs and tables
[AD-A025134] N77-12707
Computer-produced faces as an iconic display for complex data
N77-12720
Printer version of plots made by an incremental plotter
[AD-A025898] N77-12728
An approach to global register allocation
[AD-A024966] N77-12735
Monotone data flow analysis frameworks: A formal theory of global computer program optimization
N77-12743
Position-fixing and position-predicting programs for the Hewlett-Packard model 9830A programmable calculator
[AD-A024972] N77-12751
Development of computer program TWTVA for calculation of 3-D electron trajectories in coupled-cavity TWTS
[AD-A025132] N77-12757
Programmer's guide for REMAPP REMote Sensing Array Processing Procedures
[PB-256693/3] N77-12758
Computer programs for multidimensional spectra array processing
[PB-256098/5] N77-12759
OPTRIN and OPTAPE: Programs for interchange of data between REMAPP and the OPTRONICS P-1700 system
[PB-256692/5] N77-12760
Distributed computation and TENEX-related activities
[AD-A025956] N77-12766
Distributed computation study
[AD-A024670] N77-12774
An optimal method for evaluating a class of convolution integrals with related kernels
[PB-251156/6] N77-12795
A three phase model for controlled clinical trials
N77-12817
Spectral effects on cross-sectional reconstruction from X-rays
N77-12855
Lay-out of information of microfilm
[NLL-M-24127-[5828.4F]] N77-12923
A computer model for estimating development and procurement costs of aircraft DAPCA-III
[AD-A025276] N77-12929

COMPUTER SYSTEMS DESIGN
Computer interface system
[NASA-CASE-NPO-13428-1] N77-12721
Data base design for demand-responsive transit
[PB-256820/2] N77-12945

COMPUTER SYSTEMS PROGRAMS
Triangular covariance factorizations for
[NASA-CR-149147] N77-12115
LUMIS: Land Use Management and Information Systems; coordinate oriented program documentation
[NASA-CR-149165] N77-12483
Modification of the penalty function algorithm to reduce computational effort
N77-12739
Software modeling studies
[AD-A025895] N77-12749
CENTS-AID II programmer's notebook
[PB-256475/5] N77-12761
CHILD: A system for the development and didactic introduction to microprocessors
[R-4-76] N77-12768
Protection of information when using microfilm
[NLL-M-24128-[5828.4F]] N77-12922

COMPUTER TECHNIQUES
ARPA internetwork protocols project
[AD-A024823] N77-12260
ARPA internetwork protocols project
[AD-A024819] N77-12261
TCP resynchronization
[AD-A024822] N77-12262
Working Conference on Oceanographic Data Systems
[AD-A025475] N77-12663
Pilot interaction with automated airborne decision making systems
N77-12695
Mask pattern generation techniques
[AD-A025343] N77-12727

COMPUTERIZED DESIGN
Turbines: Presentation of calculated data and comparison with experiments
N77-12026
A survey of computer-aided electronic circuit design programs
[AD-A024768] N77-12309
Optimal design of mechanical systems with intermittent motion
[AD-A025010] N77-12421

COMPUTERIZED SIMULATION
Validation of the rotorcraft flight simulation program (C81) for articulated rotor helicopters through correction with flight data
[AD-A025934] N77-12045
Simulation models and baseline guidance and control for indirect-fire missiles with strapdown-inertial guidance
[AD-A024977] N77-12102
Coherent Optical Adaptive Techniques [COAT]
[AD-A025668] N77-12280
Finite element simulation of weldbonded joint deformation
[PB-256995/2] N77-12455
Development of a water quality simulation model applicable to Great Salt Lake, Utah
[PB-255718/9] N77-12596
Subjective detection of vertical acceleration: A velocity dependent response?
N77-12678
Statistical concepts in design
[AD-A025750] N77-12699
Comparison of computer simulation models with field data from nearshore environments
[AD-A025682] N77-12734
The generalized trajectory simulation system. Volume 4: Numerical operators
[AD-A025436] N77-12755
Multidither adaptive algorithms
[AD-A025185] N77-12765
Simulation software of digital data detection methods. Part 1: Theoretical analysis. Part 2: Computer programs --- coherent and differentially coherent demodulation of M-phase PSK signals
[THA/320/RWO/JS-FT-1/2] N77-12769
Digital color image processing and psychophysics within the framework of a human visual model
N77-12849
Computer simulations of planetary accretion dynamics: Sensitivity to initial conditions
[NASA-CR-149214] N77-12988

COMPUTERS
The use of computers in rotary wing testing
N77-11973
Application of the computer for on-site definition and control of wind tunnel shape for minimum boundary interference
N77-11975
FENIX: The LRLTRAN compiler for the STAR
[UCID-30128] N77-12722
Computer network research
[AD-A025914] N77-12771

CONCAVITY
Jet impingement of a curved surface
N77-12334

CONCENTRATION [COMPOSITION]
A method for the determination of total mercury in ambient air
[PB-255698/3] N77-12590

CONCRETES
California trials with Lean Concrete Base [LCB]
[PB-254035/9] N77-12443
Prestress tendons on short radius curves
[PB-256015/9] N77-12458
Durability and behavior of prestressed concrete beams. Report 5: Laboratory tests of weathered pretensioned beams
[AD-A025694] N77-12462
An analytical model for uniaxial cyclic inelastic behavior of reinforced concrete
[AD-A024910] N77-12465

CONDENSATION
The kinetics of evolution of water vapor clusters in air
[AD-A025675] N77-12349
Transfer of angular momentum and condensation of grains
N77-12975
Accretion of the condensation products
N77-12976
Transplanetary condensation
N77-12977

CONDENSERS [LIQUIFIERS]
Feasibility study for a direct, air-cooled condensation system
[PB-256403/7] N77-12537

CONDENSING
Study of evaporation and condensation problems by kinetic theory, volume 41, no. 5
[ISAS-541] N77-12330

CONDUCTORS
Numerical investigations of monopole antenna systems on conducting cylinders --- satellite antennas
[R-166] N77-12250

CONFERENCES
The electron factor in catalysis on metals electrocatalysis on non-metallic surfaces
[PB-256264/3] N77-12166
Processing of polymeric materials
[PB-255986/2] N77-12225
Symposium on nondestructive test and evaluation of airport pavements
[AD-A025442] N77-12444
Proceedings of the Mineral Economics Symposium: Winning the high stakes at the critical commodity game
[PB-255607/4] N77-12502
The Basis for Effective Management of Lighting Energy
[PB-256070/4] N77-12544
Conference proceedings, Energy from the Oceans, Fact or Fantasy
[PB-256093/6] N77-12547
A compilation of papers presented at the 208 Area-wide Water Quality Management Workshops
[PB-254663/8] N77-12561
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
An evaluation of public hearings on water development projects in Mississippi
[PB-256583/6] N77-12944

CONSTRUCTION MATERIALS
Instrumentation and equipment for testing highway materials, products, and performance
[PB-256138/9] N77-12377
An analytical model for uniaxial cyclic inelastic behavior of reinforced concrete
[AD-A024910] N77-12465

CONTACT LENSES
Flight fitness and pliant contact lenses
N77-12714

CONTAINERLESS MELTS
Manufacturing unique glasses in space
[NASA-CR-150067] N77-12083

CONTAINERS
Outdoor evaluation: Study means of assuring MIL-D-6054 steel drums are hermetically sealed
[AD-A025809] N77-12418

CONTAMINANTS
Deposition of suspensions in laminar flow
[AD-A025886] N77-12341
Review of present knowledge of plant injury by air pollution
[WMO-431] N77-12559

CONTINENTAL SHELVES
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473
CONTINUUM MECHANICS
On thermodynamics and the nature of the second law. 1: Single phase continua
[AD-A025109] N77-12915
CONTRACTION
The numerical solution of the steady flow of Newtonian and non-Newtonian fluids through a contraction
[AD-A025774] N77-12344
CONTRAILS
Accretion of the condensation products
N77-12976
CONTROL DATA [COMPUTERS]
Computer interface system
[NASA-CASE-NPO-13428-1] N77-12721
CONTROL EQUIPMENT
Towed planning sled for delivery of oil pollution control equipment
[AD-A025247] N77-12569
CONTROL THEORY
Characteristic exponents and linear control problems
N77-12775
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777
Control theory with applications to naval hydrodynamics: The First David W. Taylor Lectures, April 1972
[AD-A025702] N77-12778
CONTROLLERS
Disk drive interface characteristics
[PB-256440/9] N77-12737
CONVECTIVE FLOW
Float-zone processing in a weightless environment
[NASA-CR-2768] N77-12954
CONVECTIVE HEAT TRANSFER
Parameters affecting electrostatic cooling --- high voltage convective cooling
[NASA-TM-X-73350] N77-12329
CONVERGENCE
Using strong convergence to accelerate value iteration
[AD-A025604] N77-12746
Toward a convergent perturbation theory
N77-12785
CONVERGENT-DIVERGENT NOZZLES
Through-flow calculation procedures for application to high speed large turbines
N77-12020
CONVOLUTION INTEGRALS
An optimal method for evaluating a class of convolution integrals with related kernels
[PB-251156/6] N77-12795
Pulse analysis of acoustic emission signals
N77-12831
COOLING
Parameters affecting electrostatic cooling --- high voltage convective cooling
[NASA-TM-X-73350] N77-12329
COOLING SYSTEMS
Auxiliary power system for activity cooled aircraft
[NASA-CASE-LAR-11626-1] N77-12332
Measured performance of a 3 ton LiBr absorption water chiller and its effect on cooling system operation
[NASA-TM-X-73496] N77-12518
COPPER
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289
High velocity behavior of dislocations in copper
[AD-A025484] N77-12907
COPPER COMPOUNDS
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper [I] oxime imines of 2, 3-butanedione
N77-12889
CORROSION PREVENTION
Development of erosion resistant claddings for helicopter rotor blades
[AD-A024894] N77-12054
CORROSION RESISTANCE
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy
N77-12178
Effect of a chromium-containing fuel additive on hot corrosion
[NASA-TM-X-73465] N77-12184
CORROSION TESTS
Hot corrosion and oxidation studies of pure nickel and Ni-Cr, Ni-Si and Ni-Cr-Si alloys at 1000 C
[AD-A024708] N77-12201
Progress report on the corrosion behavior of selected stainless steels in soil environments
[PB-256329/4] N77-12202
COSMOLOGY
Plasma physics and hetegony
N77-12973
COSMONAUTS
Entrance of mankind into space [15th anniversary of the first manned flight into space]
[NASA-TT-F-17114] N77-12082
COST ANALYSIS
Environmental effects on maintenance costs for aircraft equipment
[AD-A025801] N77-12048
Shipboard Data Multiplex System [SDMS]. A new design for lower ship cost and improved flexibility
[X75-1095/301] - N77-12246
SEATSAT programs option analysis
[NASA-CR-149229] N77-12477
A methodology for the evaluation of program cost and schedule risk for the SEASAT program
[NASA-CR-149230] N77-12478
Data base design for demand-responsive transit
[PB-256820/2] N77-12945
The cost of municipal water supply: A case study
[PB-255960/7] N77-12948
COST EFFECTIVENESS
Development and application of a low cost gas dynamic laser test facility
[AD-A025648] N77-12074
Engineering efficiency of high unit-capacity metallurgical units
[NLL-M-25379-[5828.4F]] N77-12175
COST ESTIMATES
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090
Calculation of cost in design of machinery
[JPRS-68285] N77-12422
A computer model for estimating development and procurement costs of aircraft DAPCA-III
[AD-A025276] N77-12929
The application of design-to-cost acquisition policies to selected electronics subsystem development programs
[AD-A024895] N77-12931
Personal rapid transit research conducted at the Aerospace Corporation
[PB-256846/7] N77-12946
COULOMETRY
Differential coulostatic polarography
N77-12154
COUNTERMEASURES
Army preliminary evaluation JOH-58A helicopter with low reflective paint and infrared countermeasure exhaust system
[AD-A024727] N77-12042
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388
COUPLING
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 1: Multiconductor transmission line theory
[AD-A025028] N77-12304
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 2: Computation of the capacitance matrixes for ribbon cables
[AD-A025029] N77-12305
COVARIANCE
Space shuttle navigation analysis
[NASA-CR-151113] N77-12112
Triangular covariance factorizations for
[NASA-CR-149147] N77-12115
Covariance expressions for second and lower order derivatives of the anomalous potential
[AD-A024720] N77-12626
Square-root ratio estimation
[AD-A025241] N77-12802
CRACK PROPAGATION
The effect of adhesive layer on crack propagation in laminates
N77-12132
Fractographic evaluation of fracture specimens
[AD-A025746] N77-12194
Fatigue crack growth in aluminum alloys
[AD-A025196] N77-12207
Growth of part-through cracks in simple construction elements
[IFKM-76/1] N77-12439
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
CRACKING [FRACTURING]
A study of the crack damage in fuel-filled tank walls due to ballistic penetrators
[AD-A025430] N77-12449
CRASHES
Full-scale crash test of a CH-47C helicopter
[NASA-TM-X-3412] N77-12027
CRITICAL FREQUENCIES
Analysis of occurrence of sporadic E and accuracy of predictions of sporadic-E critical frequencies for Temperate Latitude Northern Hemisphere Stations
[PB-255875/7] N77-12268
CRITICAL PATH METHOD
Distance constraints for tree network multifacility location problems
[AD-A025287] N77-12770
CRITICAL VELOCITY
Mass distribution and the critical velocity
N77-12979
CROP GROWTH
The Large Area Crop Inventory Experiment [LACIE]
[NASA-TM-X-74225] N77-12480
Large Area Crop Inventory Experiment [LACIE]. Phase 1: Evaluation report
[NASA-TM-X-74226] N77-12481
CROSSED FIELD AMPLIFIERS
A follow-on study on crossed-field amplifiers for TVBS mission --- television broadcasting satellite
[HR1084] N77-12251
CRUDE OIL
A survey of salt deposits and salt caverns: Their relevance to the strategic petroleum reserve
[PB-255948/2] N77-12500
Crude oil supply alternatives for the Northern Tier states
[PB-255991/2] N77-12530
Crude supply alternatives for the Northern Tier states. Volume 1: Executive summary
[PB-255992/0] N77-12531
Crude supply alternatives for the Northern Tier states. Volume 2: Technical report
[PB-255993/8] N77-12532
Petroleum market shares. Report on sales of propane to ultimate consumers, 1975
[PB-255624/9] N77-12540
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572
Temperature effects of crude oil in the upper intertidal zone
[PB-255956/5] N77-12581
CRYOGENIC EQUIPMENT
The use of a prototype cryogenic gas chromatograph in combination with PTGC for analysis of inorganic and organic gases: Application to air pollution studies
N77-12144
CRYOGENIC FLUID STORAGE
Purging of a multilayer insulation with dacron tuft spacer by gas diffusion
[NASA-TM-X-3456] N77-12099
CRYOGENIC WIND TUNNELS
Design features and operational characteristics of the Langley 0.3-meter transonic cryogenic tunnel
[NASA-TN-D-8304] N77-12071
CRYSTAL DEFECTS
Structural defects in solids
N77-12894
CRYSTAL GROWTH
Web-dendritic ribbon growth
[NASA-CR-149237] N77-12512
Dip coating process: Silicon sheet growth development for the large-area silicon sheet task of the low-cost silicon solar array project
[NASA-CR-149242] N77-12513
Large area silicon sheet by EFG
[C-500] N77-12515
Growth of single crystals of some rare-earth-cobalt compounds R2Co17, from the melt
[AD-A025141] N77-12913
Schreibersite growth and its influence on the metallography of coarse structured iron meteorites
N77-12958
CRYSTAL LATTICES
The superhyperfine structure of a system exhibiting the dynamic Jahn-Teller effect: CaF2:Sc[2+]
N77-12846
Properties of electron gas in constant magnetic and electric fields
[AD-A025464] N77-12905
Absorption of ultrasound in organic crystals
[AD-A025174] N77-12912
CRYSTAL STRUCTURE
High order Borrmann diffraction
N77-12883
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper [I] oxime imines of 2, 3-butanedione
N77-12889
Heterogeneous nucleation and its influence on the structure of thin films
N77-12898
Float-zone processing in a weightless environment
[NASA-CR-2768] N77-12954
CRYSTAL SURFACES
Resonance-enhanced allowed, field-induced and wave-vector-dependent Raman scattering from the surface region of InAs
N77-12887
CRYSTALLIZATION
Optical studies of the stress-induced crystallization of rubbers
N77-12215
Side chain crystallization of long side chain polymers
N77-12217
CURVE FITTING
Pearson curves revisited
[AD-A025696] N77-12809

CUSHIONS
Aircraft tires: Balance pad bonding integrity
[AD-A024815] N77-12413
CUT-OFF
Follow-up filter
[CEPHAG-23/75] N77-12299
CYCLIC HYDROCARBONS
Luminescence properties of cyclic polynitramines
N77-12850
CYCLOHEXANE
Ionization processes relevant to the formation of new materials
[AD-A025197] N77-12130
CYCLONES
Tropical cyclone initiation by the tropical upper tropospheric trough
[AD-A025456] N77-12656
CYLINDRICAL BODIES
Methods for solving the viscoelasticity equations for cylinder and sphere problems
[AD-A025302] N77-12800
CYLINDRICAL SHELLS
Dynamic interaction of shells and plates with the ambient medium
N77-12432
On stretching, bending, twisting and flexure of cylindrical shells
[AD-A025676] N77-12453

D

D REGION
Photon interactions with atmospheric negative ions
[AD-A025770] N77-12163
DACRON [TRADEMARK]
Purging of a multilayer insulation with dacron tuft spacer by gas diffusion
[NASA-TM-X-3456] N77-12099
DAMPING
High strength-high damping capacity wrought magnesium alloys
[AD-A025164] N77-12212
DATA ACQUISITION
Onboard experiment data support facility. Task 2 report: Definition of onboard processing requirements
[NASA-CR-151108] N77-12120
Analysis of Skylab follow-on orbital neutron environmental data
[NASA-CR-150109] N77-12368
An analysis of data input systems and a survey of other data bases for the Naval environmental Protection Support Service [NEPSS]
[AD-A035085] N77-12564
Sampling and data gathering strategies for future USAF anthropometry
[AD-A025240] N77-12697
DATA BASES
Improving the reliability of factor analysis of chemical data by utilizing the measured analytical uncertainty
[AD-A025951] N77-12169
An analysis of data input systems and a survey of other data bases for the Naval environmental Protection Support Service [NEPSS]
[AD-A035085] N77-12564
SPARCOM: A sparse matrix associative relational approach to dynamic data structuring and data retrieval
N77-12921
Data base design for demand-responsive transit
[PB-256820/2] N77-12945
DATA COMPRESSION
Space communication system for compressed data with a concatenated Reed-Solomon-Viterbi coding channel
[NASA-CASE-NPO-13545-1] N77-12240
DATA CONVERSION ROUTINES
Monotone data flow analysis frameworks: A formal theory of global computer program optimization
N77-12743
DATA LINKS
Remote portable solar powered microwave system
[AD-A025978] N77-12556
DATA MANAGEMENT
USA report proposes: An end to free satellite pictures
[NASA-TT-F-16732] N77-12479
LUMIS: Land Use Management and Information Systems; coordinate oriented program documentation
[NASA-CR-149165] N77-12483
Development of the Military Construction Data System [MCDS], part 2
[AD-A024938] N77-12736
DATA PROCESSING
Use and analysis of the scientific data from the INTASAT satellite
[NASA-TT-F-16738] N77-12094
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243
Working Conference on Oceanographic Data Systems
[AD-A025475] N77-12663
Computer-produced faces as an iconic display for complex data
N77-12720
Disease information system
[AD-A025477] N77-12732
Programmer's guide for REMAPP REMote Sensing Array Processing Procedures
[PB-256693/3] N77-12758
Computer programs for multidimensional spectra array processing
[PB-256098/5] N77-12759
OPTRIN and OPTAPE: Programs for interchange of data between REMAPP and the OPTRONICS P-1700 system
[PB-256692/5] N77-12760
Data processing and industrial process control. Part 3: Numerical control [level 2 functions] and economic optimization [level 3 functions]
[CRIF-IN-3] N77-12776
Spectral estimation with reduction of processed data
[R-2-75] N77-12818
Protection of information when using microfilm
[NLL-M-24128-[5828.4F]] N77-12922
Lay-out of information of microfilm
[NLL-M-24127-[5828.4F]] N77-12923
DATA PROCESSING EQUIPMENT
Space communication system for compressed data with a concatenated Reed-Solomon-Viterbi coding channel
[NASA-CASE-NPO-13545-1] N77-12240
Disk drive interface characteristics
[PB-256440/9] N77-12737
DATA REDUCTION
Satellite beacon data reduction and analysis
[AD-A025329] N77-12617
Encoding reduction and classification of two-dimensional data by factor analysis techniques
N77-12738
Spectral estimation with reduction of processed data
[R-2-75] N77-12818
DATA STORAGE
An approach of developing fast transform algorithms
[AD-A024665] N77-12762
DATA SYSTEMS
Working Conference on Oceanographic Data Systems
[AD-A025475] N77-12663
Recognition of coded symbols on reading out data
[NLL-M-24126-[5828.4F]] N77-12924
DATA TRANSMISSION
Shipboard Data Multiplex System [SDMS]. A new design for lower ship cost and improved flexibility
[X75-1095/301] N77-12246
University College London ARPANET project
[AD-A025293] N77-12253
Interprocess communication protocols for computer networks
[AD-A025508] N77-12254
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 1: Text
[PB-256822/8] N77-12729
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 2: Appendixes
[PB-256823/6] N77-12730
DC 10 AIRCRAFT
Advanced composite rudders for DC-10 aircraft: Design, manufacturing, and ground tests
[NASA-CR-145068] N77-12039
DECISION MAKING
Pilot interaction with automated airborne decision making systems
N77-12695
Economic evaluation methods in community planning
[PB-253432/9] N77-12936
DECISION THEORY
A three phase model for controlled clinical trials
N77-12817
A subject selection problem employing a new criterion
[AD-A025803] N77-12822
A replacement policy for components of a pure series system utilizing one component as an indicator of replacement time
[AD-A024979] N77-12825
DECODING
Differential pulse code modulation
[NASA-CASE-MSC-12506-1] N77-12239
Recognition of coded symbols on reading out data
[NLL-M-24126-[5828.4F]] N77-12924
DECOMPRESSION SICKNESS
Clearance and saturation of hydrogen gas in man with special emphasis on the brain
[AD-A025952] N77-12692
DEFECTS
Influence of subsurface defects on fatigue properties of titanium alloys
[AD-A025892] N77-12193
DEFENSE PROGRAM
Scientific and technical information needs of users or potential users of the DSA-administered, DoD Information Analysis Centers
[AD-A024937] N77-12928
DEFLECTION
Cumulative deflection and rigid pavement serviceability
[AD-A024969] N77-12077
DEFORMATION
On stretching, bending, twisting and flexure of cylindrical shells
[AD-A025676] N77-12453
Finite element simulation of weldbonded joint deformation
[PB-256995/2] N77-12455
DEMODULATION
Simulation software of digital data detection methods. Part 1: Theoretical analysis. Part 2: Computer programs — coherent and differentially coherent demodulation of M-phase PSK signals
[THA/320/RWO/JS-PT-1/2] N77-12769
DENDRITIC CRYSTALS
Web-dendritic ribbon growth
[NASA-CR-149237] N77-12512
DENMARK
Transients in low voltage power system: Descriptions of transients observed in the area of Copenhagen in some industries, hospitals, offices, laboratories, etc.
[ECR-63] N77-12294
DENSITY DISTRIBUTION
Urban densities for public transportation
[PB-256636/2] N77-12952
DEOXYGENATION
Catalytic deoxygenation of aqueous solution by hydrazine
[AD-A025794] N77-12233
DEPLETION
Economics of depletable resources: Market forces and intertemporal bias
[PB-255623/1] N77-12930
DEPOSITION
Deposition of suspensions in laminar flow
[AD-A025886] N77-12341
Accretion of the condensation products
N77-12976
DESIGN ANALYSIS
Through-flow calculations: Theory and practice in turbomachinery design
N77-12017
Design of turbine, using distributed or average losses; effect of blowing
N77-12021
Compressor design and experimental results
N77-12023
Design features and operational characteristics of the Langley 0.3-meter transonic cryogenic tunnel
[NASA-TN-D-8304] N77-12071
Design studies of a motion system for the VTOL simulation facility
[AD-A024732] N77-12075
Comparative analysis of designs and implementations of reaction flying vehicles proposed during the nineteenth and beginning of the twentieth centuries
[NASA-TT-F-16749] N77-12081
Roller bearing geometry design
[NASA-CR-135082] N77-12403
Calculation of cost in design of machinery
[JPRS-68285] N77-12422
DEUTERIUM
The behaviour of impurities in a steady-state DT gas-blanket reactor — ion-ion and electron-ion collision contribution to Nernst effect
[REPT-75-90] N77-12877
DEVELOPING NATIONS
Low cost data and text communication for the less developed countries: A study with special reference to the needs of the international agricultural research centers
[PB-256067/0] N77-12271
DF LASERS
Study of surface finishing and coating of DF laser windows
[AD-A025710] N77-12396
DIAGNOSIS
Radiation exposure of the Italian population due to medical diagnostic examinations in 1974
[ISS-P-75/13] N77-12683
Electron spin resonance of lyophilized blood sample — for cancer diagnosis
[ISS-P-75/17] N77-12685
DIATOMIC MOLECULES
A computer program for the calculation of relative emission coefficients of diatomic molecules in the high temperature range
[ESA-TT-300] N77-12914
DIBROMIDES
Summary characterizations of selected chemicals of near-term interest
[PB-255817/9] N77-12591
DIELECTRIC PROPERTIES
A universal impedance for soils
[AD-A025759] N77-12624

DIELECTRICS
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388
DIFFERENTIAL EQUATIONS
Differential coulostatic polarography
N77-12154
Similar solutions of the differential equations for mean velocities, turbulence energy and turbulence length
[ESA-TT-354] N77-12339
Asymptotic properties of solutions of the equation y' = f[x]phi[y]
N77-12791
A program for the numerical solution of large sparse systems of algebraic and implicitly defined stiff differential equations
[AD-A024764] N77-12804
Numerical methods for stiff nonlinear and quadratic differential equations
[AD-A025200] N77-12810
Contribution to Frenkel condensation theory
N77-12899
DIFFERENTIAL GEOMETRY
Methods for solving the viscoelasticity equations for cylinder and sphere problems
[AD-A025302] N77-12800
DIFFRACTION PATTERNS
Development and application of an interferometric system for measuring crack displacements
[NASA-CR-145106] N77-12367
Holographic interferometer background fringe reduction by dual vacuum application
[AD-A024741] N77-12379
DIGITAL COMPUTERS
Demonstration program for Omega receiver prototype microcomputer data processing
[NASA-CR-149226] N77-12029
Simulation models and baseline guidance and control for indirect-fire missiles with strapdown-inertial guidance
[AD-A024977] N77-12102
The design of totally self-checking systems
[AD-A025608] N77-12725
Maximal clocking rates for pipelined digital systems
[AD-A025611] N77-12726
DIGITAL FILTERS
An approach of developing fast transform algorithms
[AD-A024665] N77-12762
DIGITAL SIMULATION
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs
[PB-256564/6] N77-12939
DIGITAL SYSTEMS
Moment space error bounds for digital communication systems with intersymbol interference based on nth moment
[AD-A025013] N77-12288
The use of context in character recognition
N77-12744
DIGITAL TECHNIQUES
Digital orthophoto study Add-On
[AD-A025690] N77-12498
Digital ionospheric sounding in support of arctic research
[AD-A024706] N77-12630
DIODES
Low loss low hold power diode phase shifter development
[AD-A024779] N77-12312
DIPOLE ANTENNAS
The horizontally polarized dipole antenna as a solution to the problems of high frequency short range communications
[AD-A025674] N77-12277
DIRECT CURRENT
Differential pulse code modulation
[NASA-CASE-MSC-12506-1] N77-12239
Feasibility study of the use of current limiting devices in interruption and sectionalizing of DC circuits in mines
[PB-256541/4] N77-12322
DISEASES
Disease information system
[AD-A025477] N77-12732
DISLOCATIONS [MATERIALS]
High velocity behavior of dislocations in copper
[AD-A025484] N77-12907
DISORDERS
Bounds for effective elastic moduli of disordered materials. Part 1: Formal theory
N77-12438
DISPLACEMENT
A study of servo accelerometer design for low frequency vibration measurement — of large structures
[ISVR-TR-85] N77-12369
DISPLAY DEVICES
Investigation of the use of an electronic multifunction display and an electromechanical horizontal situation indicator for guidance and control of powered-lift short-haul aircraft
[NASA-CR-137922] N77-12055
Flight simulator evaluation of an electronic paravisual guidance indicator
[ESA-TT-350] N77-12056
Development of a prototype experimental plan to evaluate stabilized optical viewing devices. 2: Inflight measures of airsickness potential
[AD-A025455] N77-12704
A visual display system for the HP 2100A computer
[R-1-76] N77-12723
Graphic display unit for the IBM 7040 computer of the Higher Institute of Health
[ISS-T-75/2] N77-12724
Image descriptors for display
[AD-A024960] N77-12871
DISTANCE MEASURING EQUIPMENT
An analysis of the position location and reporting system's performance characteristics
[AD-A025437] N77-12038
DISTRIBUTION FUNCTIONS
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832
DIURNAL VARIATIONS
Investigations on ionospheric electron content and electron density irregularities at low latitudes with geostationary satellites
[AD-A024957] N77-12628
DIVING [UNDERWATER]
Clearance and saturation of hydrogen gas in man with special emphasis on the brain
[AD-A025952] N77-12692
DOCUMENTATION
Distributed computation and TENEX-related activities
[AD-A025956] N77-12766
DOPED CRYSTALS
Charge transport and the photorefractive effect in doped and undoped lithium tantalate
N77-12358
Analysis of carrier concentration and mobility in boron-doped silicon
N77-12886
DOPPLER RADAR
Colloquium on Solid State Transmitters for Radar
[AD-A025189] N77-12255
A VHF transmitter and system synchronizer for use in a portable Doppler radar system
[PB-256094/4] N77-12270
Performance of a range-ambiguous MTI and Doppler filter system
[AD-A025683] N77-12278
DRAG REDUCTION
A study of the drag characteristics and polymer diffusion in the boundary layer of an axisymmetric body
[AD-A024667] N77-12227
DYNAMIC MODELS
Reduced order models for power system analysis
N77-12291
DYNAMIC MODULUS OF ELASTICITY
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
DYNAMIC PRESSURE
Blast pressures inside and outside suppressive structures
[AD-A025504] N77-12447
DYNAMIC RESPONSE
Analysis of dynamic aircraft response to bomb damage repair
[AD-A025647] N77-12047
Cumulative deflection and rigid pavement serviceability
[AD-A024969] N77-12077
Dynamic behavior of laminated polymeric matrix composites
[AD-A025622] N77-12135
Pretest prediction of dynamic structural response to ground motion event ESSEX-5
[AD-A023911] N77-12440
Dynamic response of anisotropic laminated plates under initial stress to impact of a mass
[AD-A025906] N77-12445
A prediction of response of the head and neck of US adult military population to dynamic impact acceleration from selected dynamic test subjects
[AD-A025785] N77-12702
DYNAMIC STRUCTURAL ANALYSIS
Measurement of the static influence coefficient of the AH-1G Cobra fuselage
[AD-A025114] N77-12044
Pretest prediction of dynamic structural response to ground motion event ESSEX-5
[AD-A023911] N77-12440
Topology in biology, the relationship of structure to function
N77-12666
SPARCOM: A sparse matrix associative relational approach to dynamic data structuring and data retrieval
N77-12921
DYNAMIC TESTS
Evaluation techniques for ball bearings using a high speed test bench
[LRBA-E-602-NT-42/SIE] N77-12407
DYNAMICS
Magnetosphere dynamics by localization of ultra low frequency waves
[CEPHAG-3/76] N77-12614

E

EARTH [PLANET]
Origin of the earth's ocean and atmosphere
N77-12984
EARTH ATMOSPHERE
The radiation and energy budgets of the earth using both ground-based and satellite-derived values of total cloud cover
[PB-256756/8] N77-12632
Origin of the earth's ocean and atmosphere
N77-12984
EARTH MOVEMENTS
Pretest prediction of dynamic structural response to ground motion event ESSEX-5
[AD-A023911] N77-12440
EARTH RESOURCES
Quarterly literature review of the remote sensing of natural resources, third quarter 1976 — bibliography
[NASA-CR-149163] N77-12470
An application of ERTS technology to the evaluation of coal strip mining and reclamation in the northern Great Plains
[NASA-CR-149208] N77-12486
Our natural resources: What is our water worth. 1975 - 1978 water quality management planning program, North Central Texas Council of Governments
[PB-256976/2] N77-12947
EARTH-MOON SYSTEM
Origin and evolution of the Earth-Moon system
N77-12982
EARTHQUAKE DAMAGE
History of earthquakes in Colombia
N77-12607
EARTHQUAKES
History of earthquakes in Colombia
N77-12607
Seismic discrimination
[AD-A025777] N77-12627
ECHELETTE GRATINGS
Analytical applications of a high resolution echelle monochromator
N77-12151
ECLIPTIC
Solar out-of-ecliptic study. Volume 1: Executive summary — Jupiter swingby scientific mission
[ESS/SS-699-VOL-1] N77-12087
Solar out-of-ecliptic study. Volume 2: System analysis and definition — Jupiter swingby scientific mission
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition — Jupiter swingby scientific mission
[ESS/SS-699-VOL-3] N77-12089
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091
ECONOMIC ANALYSIS
Orbiter description document for Jupiter Orbiter Probe 1981/1982 Mission
[NASA-CR-149244] N77-12097
An economical square-wave polarograph for electrochemical analysis
N77-12149
SEASAT: A candidate ocean industry economic verification experiments
[NASA-CR-149228] N77-12476
Proceedings of the Mineral Economics Symposium: Winning the high stakes at the critical commodity game
[PB-255607/4] N77-12502
Preliminary economics and comment: In-situ gasification of coal for power and SNG
[PB-256034/0] N77-12554
A plan for application system verification tests: The value of improved meteorological information, volume 1 — economic consequences of improved meteorological information
[NASA-CR-149210] N77-12634
A plan for application system verification tests. The value of improved meteorological information, volume 2 — economic consequence of improved meteorological information
[NASA-CR-149169] N77-12635
A plan for application system verification tests--The value of improved meteorological information: Execu-

tive summary --- economic consequence of improved meteorological information
[NASA-CR-149168] N77-12636
Code of federal regulations. 14. Aeronautics and space, parts 200 to 1199 --- regulations and standards for the civil aeronautics board
N77-12934
Economic evaluation methods in community planning
[PB-253432/9] N77-12936
Implementation of proven technology in making the highway environment safe
[PB-256664] N77-12950

ECONOMIC FACTORS
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585

ECONOMICS
Economics of depletable resources: Market forces and intertemporal bias
[PB-255623/1] N77-12930

ECOSYSTEMS
On the habitability of Mars: An approach to planetary ecosynthesis
[NASA-SP-414] N77-12718

EDITING
XED users manual. Beginning instruction
[AD-A025738] N77-12752

EIGENVALUES
The numerical solution of the eigenvalue problem for integral operators using the method of projections
N77-12781

EIKONAL EQUATION
Spin dependence at very high energies in an eikonal picture of pp elastic scattering
N77-12842

ELASTIC DEFORMATION
Finite deformation of elastic-plastic and elastic/viscoplastic continua
N77-12429

ELASTIC SCATTERING
Spin dependence at very high energies in an eikonal picture of pp elastic scattering
N77-12842

ELASTOMERS
Effects of the physiological environment on the long-term physical performance of polymeric materials
[NASA-CR-149206] N77-12220

ELECTRIC CONDUCTORS
Transient currents in partially shielded conductors: A circuit model
[AD-A025135] N77-12324

ELECTRIC DISCHARGES
Process for manufacture of stable highly pure metals which form gaseous hydrides, such as silicon or germanium, by means of electrical discharges
[NASA-TT-F-16763] N77-12180

ELECTRIC ENERGY STORAGE
Energy storage systems: Behavior of SD 15K hermetically sealed NiCd cells; development trends
[NASA-TT-F-16761] N77-12508
The Redox flow system for solar photovoltaic energy storage
[NASA-TM-X-73562] N77-12522

ELECTRIC EQUIPMENT TESTS
Final engineering report for Goldstone operations support radar
[NASA-CR-149239] N77-12244

ELECTRIC FIELDS
Parameters affecting electrostatic cooling --- high voltage convective cooling
[NASA-TM-X-73350] N77-12329
Design, construction and evaluation of a high pressure, high electric field optoacoustic detector
[AD-A025772] N77-12864
Properties of electron gas in constant magnetic and electric fields
[AD-A025464] N77-12905
Charged-particle absorption by Io
[NASA-CR-149162] N77-12989

ELECTRIC POTENTIAL
Energy spectra of electrons with energies 3 keV probably accelerated in onteraction of the injected electron beam with the ionospheric plasma in Araks experiment --- onboard Eridan sounding rocket
[D-222] N77-12611

ELECTRIC POWER
Planning models for the assessment of advanced energy storage systems
N77-12504

ELECTRIC POWER PLANTS
Thermal energy storage material thermophysical property measurement and heat transfer impact
[NASA-CR-135098] N77-12510
Physical and biological aspects of thermal pollution in sea water --- forecasting electric power production in Italy
[ISS-L-75/14] N77-12560
Assessment of the impact of proposed thermal effluent guidelines for the steam electric power industry
[PB-255937/5] N77-12587
Laboratory analysis of solvent refined coal
[PB-255550/6] N77-12598

ELECTRIC POWER SUPPLIES
Costs of alternative sources of electricity
[PB-255765/0] N77-12528
Assessment of cadmium sulfide photovoltaic arrays for large scale electric utility applications
[PB-255646/2] N77-12551

ELECTRIC WIRE
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 1: Multiconductor transmission line theory
[AD-A025028] N77-12304
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 2: Computation of the capacitance matrixes for ribbon cables
[AD-A025029] N77-12305

ELECTRICAL GROUNDING
A computer program for radiation from arbitrarily oriented wire antennas over imperfect ground
[AD-A025457] N77-12274

ELECTRICAL IMPEDANCE
Differential coulostatic polarography
N77-12154

ELECTRICAL INSULATION
Electrical properties of polycrystalline ceramic insulators
[AD-A025312] N77-12221

ELECTRICAL PROPERTIES
Electrical properties of polycrystalline ceramic insulators
[AD-A025312] N77-12221
Electronic components: A survey of the most used component types, their characteristic data, applications and failure rates
[ECR-62] N77-12293
Low frequency wave-reflection properties of the equatorial ionosphere
[AD-A025111] N77-12623

ELECTRICAL RESISTIVITY
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289
A universal impedance for soils
[AD-A025759] N77-12624

ELECTRO-OPTICS
The role of charge transport in the formation and erasure of volume phase holograms in electrooptic lithium niobate
N77-12359
Development of an optical disc recorder
[AD-A025291] N77-12372

ELECTROCATALYSTS
The electron factor in catalysis on metals electrocatalysis on non-metallic surfaces
[PB-256264/3] N77-12166

ELECTROCHEMISTRY
An economical square-wave polarograph for electrochemical analysis
N77-12149
Investigation of the stress corrosion cracking susceptibility of the alloy AlZnMgCu 1.5 with regard to electrochemical and metallurgical aspects
[ESA-TT-336] N77-12186
Optimization of PT-doped Kocite [trademark] electrodes in H3 PO4 fuel cells
[AD-A025326] N77-12529

ELECTROENCEPHALOGRAPHY
Automated electroencephalography system and electroencephalographic correlates of space motion sickness, part 2 --- sleep characteristics
[NASA-CR-151106] N77-12680

ELECTROFORMING
Process for manufacture of stable highly pure metals which form gaseous hydrides, such as silicon or germanium, by means of electrical discharges
[NASA-TT-F-16763] N77-12180

ELECTROLYTES
Interaction of aqueous electrolytes and quaternary ammonium salts
N77-12155
Solid electrolyte battery materials
[AD-A024658] N77-12542
The collection, analysis, and comparison of human sensible perspiration between sedentary and conditioned male caucasians as to the variation in selected electrolyte composition
N77-12669
Thermodynamic, structural and transport properties of some fluorite solid electrolytes
N77-12892

ELECTROMAGNETIC ABSORPTION
Charged-particle absorption by Io
[NASA-CR-149162] N77-12989

ELECTROMAGNETIC COMPATIBILITY
Electromagnetic radiation system [EMRS] for susceptibility testing
[AD-A025243] N77-12259

ELECTROMAGNETIC FIELDS
Electromagnetic radiation system [EMRS] for susceptibility testing
[AD-A025243] N77-12259

ELECTROMAGNETIC INTERFERENCE
Methods of diminishing the influence of perturbing fields on magnetometric sensors
N77-12362

ELECTROMAGNETIC NOISE
Wave analyzer dynamic range and bandwidth requirements for signal noise analysis
[AD-A024671] N77-12282

ELECTROMAGNETIC PULSES
Microwave pulse sequence methods for the study of rotational relaxation processes
N77-12241
Nuclear electromagnetic pulse simulation by point source injection techniques for shielded penetrations
[AD-A024803] N77-12276
Intense pulse phenomena
[AD-A025483] N77-12845

ELECTROMAGNETIC RADIATION
Absorptance calculations for a multilayer absorbing stack: Application to thin film photoconductor assemblies
[AD-A025798] N77-12868

ELECTROMAGNETIC SHIELDING
Nuclear electromagnetic pulse simulation by point source injection techniques for shielded penetrations
[AD-A024803] N77-12276
Transient currents in partially shielded conductors: A circuit model
[AD-A025135] N77-12324

ELECTROMAGNETIC SPECTRA
Computer programs for multidimensional spectra array processing
[PB-256098/5] N77-12759

ELECTROMECHANICAL DEVICES
SAM-D trade-off study, Electromechanical Control Actuation System [em/CAS]
[AD-A025232] N77-12104

ELECTRON BEAMS
Intermodulation study --- in traveling wave tubes
[AD-A025689] N77-12315

ELECTRON DENSITY [CONCENTRATION]
Distribution of electron density in a transitional metal impurity in dilute substitution solid solutions
[NLL-M-25348-[5828.4F]] N77-12173

ELECTRON DENSITY PROFILES
Variational calculations with hyperspherical basis sets on atomic helium and lithium
N77-12839

ELECTRON ENERGY
Relativistic effects in resonance absorption
[AD-A025192] N77-12878
Inverse mean free path, stopping power, CSDA range, and straggling in silicon and silicon dioxide for electrons of energy less than or equal to 10 keV
[AD-A025488] N77-12902

ELECTRON GAS
Properties of electron gas in constant magnetic and electric fields
[AD-A025464] N77-12905

ELECTRON IMPACT
Investigation of electron impact processes relevant to visible lasers
[AD-A025005] N77-12399
Electron impact excitation of molecular nitrogen: High energy-resolution studies of electron impact optical excitation functions of the first positive system
N77-12885

ELECTRON MICROSCOPY
Characterization study of domestic nickeliferous laterites by electron optical and X-ray techniques
[PB-256699/0] N77-12499

ELECTRON PARAMAGNETIC RESONANCE
Electron spin resonance of lyophilized blood sample --- for cancer diagnosis
[ISS-P-75/17] N77-12685

ELECTRON SCATTERING
The Frascati [e, e'p] experimental apparatus
[ISS-P-75/3] N77-12072

ELECTRON TRAJECTORIES
An 82 to 84 percent efficient, small size, 2 and 4 stage depressed collector for octave bandwidth high performance TWT's
[NASA-TM-X-73572] N77-12297

ELECTRON TUBES
Multimode phased array tube
[AD-A025691] N77-12316

ELECTRONIC EQUIPMENT
Electromagnetic radiation system [EMRS] for susceptibility testing
[AD-A025243] N77-12259
The application of design-to-cost acquisition policies to selected electronics subsystem development programs
[AD-A024895] N77-12931

ELECTRONIC EQUIPMENT TESTS
Final engineering report for Goldstone operations support radar
[NASA-CR-149239] N77-12244

ELECTRONS
Molecular orbital studies of electron deficient compounds
N77-12837

ELECTROPHORESIS
Automatic multiple-sample applicator and electrophoresis apparatus
[NASA-CASE-ARC-10991-1] N77-12157
ELECTROSTATIC PRECIPITATORS
Rapping reentrainment in a nearly full-scale pilot electrostatic precipitator
[PB-255984/7] N77-12595
A. P. S. electrostatic scrubber evaluation
[PB-256335/1] N77-12601
ELECTROSTATICS
Electrostatic calculations in membrane systems N77-12146
Electrostatic properties of JP-5 jet fuel from alternate sources
[AD-A025684] N77-12232
EMBRITTLEMENT
On the embrittlement of grain boundaries by impurities
[AD-A024940] N77-12206
On the isotope effect in hydrogen embrittlement of niobium
[AD-A025180] N77-12211
EMISSION SPECTRA
Emission spectroscopical investigation of the system F2-H2 in a shock tube
[ESA-TT-349] N77-12161
Photographic plates for emission spectrographic analysis --- noting contrast, speed, and spectral response
[MQAD-R-234] N77-12371
Intensity variations of atmospheric hydroxyl emissions
[AD-A025274] N77-12618
Geometric aspects of rocket photometry
[AD-A024947] N77-12629
A computer program for the calculation of relative emission coefficients of diatomic molecules in the high temperature range
[ESA-TT-300] N77-12914
ENCAPSULATING
Review of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays
[NASA-CR-149215] N77-12524
ENCLOSURES
Blast pressures inside and outside suppressive structures
[AD-A025504] N77-12447
ENERGY ABSORPTION
Absorption of ultrasound in organic crystals
[AD-A025174] N77-12912
ENERGY BUDGETS
The radiation and energy budgets of the earth using both ground-based and satellite-derived values of total cloud cover
[PB-256756/8] N77-12632
ENERGY CONSERVATION
California energy outlook
[UCRL-5196-REV-1] N77-12525
The Basis for Effective Management of Lighting Energy
[PB-256070/4] N77-12544
ENERGY CONSUMPTION
Review of energy forecasting methodologies and assumptions
[PB-255170/3] N77-12526
ENERGY CONVERSION
Mechanical thermal motor
[NASA-CASE-MFS-23062-1] N77-12402
Maritime and construction aspects of Ocean Thermal Energy Conversion [OTEC] plant ships
[PB-255639/7] N77-12552
ENERGY CONVERSION EFFICIENCY
Maritime and construction aspects of Ocean Thermal Energy Conversion [OTEC] plant ships
[PB-255639/7] N77-12552
ENERGY METHODS
Finite difference energy techniques for arbitrary meshes applied to linear and nonlinear problems with irregular domains N77-12428
ENERGY POLICY
Energy: A continuing bibliography with indexes
[NASA-SP-7043[10]] N77-12505
Crude supply alternatives for the Northern Tier states. Volume 1: Executive summary
[PB-255992/0] N77-12531
Crude supply alternatives for the Northern Tier states. Volume 2: Technical report
[PB-255993/8] N77-12532
Impacts of synthetic liquid fuel development. Automotive market. Volume 1: Summary
[PB-255994/6] N77-12533
Impacts of synthetic liquid fuel development. Automotive market. Volume 2
[PB-255995/3] N77-12534
Implementing coal utilization provisions of Energy Supply and Environmental Coordination Act
[PB-255855/9] N77-12549
ENERGY REQUIREMENTS
California energy outlook
[UCRL-5196-REV-1] N77-12525
Review of energy forecasting methodologies and assumptions
[PB-255170/3] N77-12526
Net energy from nuclear power
[PB-254059/9] N77-12527
ENERGY SOURCES
Crude oil supply alternatives for the Northern Tier states
[PB-255991/2] N77-12530
Implementing coal utilization provisions of Energy Supply and Environmental Coordination Act
[PB-255855/9] N77-12549
ENERGY SPECTRA
Energy spectra of electrons with energies 3 keV probably accelerated in onteraction of the injected electron beam with the ionospheric plasma in Araks experiment --- onboard Eridan sounding rocket
[D-222] N77-12611
ENERGY STORAGE
Planning models for the assessment of advanced energy storage systems N77-12504
ENERGY TECHNOLOGY
Energy: A continuing bibliography with indexes
[NASA-SP-7043[10]] N77-12505
ENERGY TRANSFER
Dynamic response of anisotropic laminated plates under initial stress to impact of a mass
[AD-A025906] N77-12445
ENGINE CONTROL
Alternatives for jet engine control
[NASA-CR-146531] N77-12058
ENGINE DESIGN
Analysis of liquid-propellant rocket engines designed by F. A. Tsander
[NASA-TT-F-16748] N77-12122
ENGINE INLETS
Analysis of pressure distortion testing
[NASA-CR-2766] N77-12041
ENTHALPY
Structural relaxation of enthalpy and heat capacity of As2Se3 glass
[AD-A025018] N77-12229
ENTROPY
Spectral analysis of a univariate process with bad data points, via maximum entropy and linear predictive techniques
[AD-A024942] N77-12756
ENVIRONMENT EFFECTS
Metals mining and milling process profiles with environmental aspects
[PB-256394/8] N77-12501
Review of present knowledge of plant injury by air pollution
[WMO-431] N77-12559
Relationship between water quality and plant growth in ponds
[PB-256513/3] N77-12594
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures
[PB-255222/2] N77-12943
ENVIRONMENT PROTECTION
An analysis of data input systems and a survey of other data bases for the Naval environmental Protection Support Service [NEPSS]
[AD-A035085] N77-12564
ENVIRONMENTAL CONTROL
Self-regulation of environmental quality: Impact analysis in California local government
[PB-254450/0] N77-12566
ENVIRONMENTAL SURVEYS
Crude supply alternatives for the Northern Tier states. Volume 1: Executive summary
[PB-255992/0] N77-12531
Crude supply alternatives for the Northern Tier states. Volume 2: Technical report
[PB-255993/8] N77-12532
Impacts of synthetic liquid fuel development. Automotive market. Volume 1: Summary
[PB-255994/6] N77-12533
Impacts of synthetic liquid fuel development. Automotive market. Volume 2
[PB-255995/3] N77-12534
Outlook for research and development in the underground gasification of coal
[PB-256155/3] N77-12555
Self-regulation of environmental quality: Impact analysis in California local government
[PB-254450/0] N77-12566
Compliance status of major air pollution facilities
[PB-256653/7] N77-12588
Summary characterizations of selected chemicals of near-term interest
[PB-255817/9] N77-12591
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
ENVIRONMENTAL TESTS
Thermal-environment testing of a 30-cm engineering model thruster
[NASA-TM-X-73522] N77-12121
Environmental effects on the strength of a glass fiber-reinforced-plastic rod material
[PB-256296/5] N77-12224
ENZYMES
Effects of acceleration on selected serum enzymes
[AD-A025965] N77-12691
EPITAXY
Analysis of epitaxial drift field N on P silicon solar cells
[NASA-TM-X-73563] N77-12523
EPOXY COMPOUNDS
Advanced composite rudders for DC-10 aircraft: Design, manufacturing, and ground tests
[NASA-CR-145068] N77-12039
EPOXY RESINS
Effect of low velocity impact damage on the compressive strength of graphite/epoxy hat-stiffened panels
[NASA-TM-X-73988] N77-12134
The thermal conductivity of metal-power/epoxy-resin composites
[AD-A024963] N77-12143
EQUATIONS OF MOTION
Determining the motion of space vehicles
[NASA-TT-F-17100] N77-12118
Analysis of cage motion
[AD-A025735] N77-12412
Optimal design of mechanical systems with intermittent motion
[AD-A025010] N77-12421
EQUATIONS OF STATE
Modified GRAY: An improved three-phase equation of state for metals
[AD-A025260] N77-12192
Equilibrium compositions and compressibility factors for air in the temperature range 1500 to 13000 Kelvin and for densities from 0.000001 to 1000 times standard density
[AD-A025449] N77-12916
Equations of state and impact-induced shock-wave attenuation on the moon
[NASA-CR-149245] N77-12987
EQUATORIAL ORBITS
Automatic magnetic control of a momentum-biased observatory in equatorial orbit N77-12098
EQUIPMENT SPECIFICATIONS
Equipment compliance report for AN/URC-78[XE-1]/V. Volume 4: Service condition test report
[AD-A025667] N77-12279
An 82 to 84 percent efficient, small size, 2 and 4 stage depressed collector for octave bandwidth high performance TWT's
[NASA-TM-X-73572] N77-12297
Engineering design criteria for an image intensifier/image converter camera
[NASA-CR-151112] N77-12365
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572
Design handbook for imagery interpretation equipment
[AD-A025453] N77-12869
ERGODIC PROCESS
Invariant measures and its applications N77-12792
EROSION
Development of erosion resistant claddings for helicopter rotor blades
[AD-A024894] N77-12054
ERROR ANALYSIS
Error analysis of minimum information and Smith's direct methods for inverting the radiative transfer equation
[AD-A025478] N77-12865
ERROR DETECTION CODES
The design of totally self-checking systems
[AD-A025608] N77-12725
ERRORS
Investigation of the effect of inspection error on sequential sampling plans
[AD-A024760] N77-12427
ESCAPE SYSTEMS
A model for analytic investigation of three-dimensional head-spine dynamics
[AD-A025911] N77-12686
ESTIMATES
Spectral estimation with reduction of processed data
[R-2-75] N77-12818
Time Delay Estimation
[AD-A025620] N77-12834
ETHYLENE COMPOUNDS
Summary characterizations of selected chemicals of near-term interest
[PB-255817/9] N77-12591
EUROPIUM
A Moessbauer study of Sn[2+]-doped europium monochalcogenides and a new look at the experimental foundations of spin-wave theory N77-12888
EUTECTIC ALLOYS
Directionally solidified iron-base eutectic alloys
[NASA-TN-D-8354] N77-12185
EVALUATION
Evaluation techniques for ball bearings using a high speed test bench
[LRBA-E-602-NT-42/SIE] N77-12407

EVAPORATION
Evaporation and surface energy of a metal deposited in a discontinuous thin film
N77-12179
Study of evaporation and condensation problems by kinetic theory, volume 41, no. 5
[ISAS-541] N77-12330
EXCITATION
Investigations of surfaces and interfaces using optical excitation of surface plasmons
[AD-A025285] N77-12162
EXHAUST FLOW SIMULATION
On the simulation of an underexpanded propulsive jet for the investigation of the static longitudinal stability of an axially symmetric flight vehicle in supersonic flow
[ESA-TT-334] N77-12004
EXHAUST GASES
Emissions and performance of catalysts for gas turbine catalytic combustors
[NASA-TM-X-73543] N77-12406
Photochemical air pollution: Weekday-weekend differences
N77-12557
EXHAUST NOZZLES
An experimental investigation of the Whistler nozzle and an analytical investigation of a ring wing in supersonic flow
[AD-A025672] N77-12009
Effect of the constrictive area ratio on the rocket exhaust flow-field in the launcher
[AD-A024657] N77-12127
EXOBIOLOGY
Aeronautical Engineering: A special bibliography with indexes, supplement 74 — Aerospace Medicine and Biology bibliography, supplement [74]. September 1976
[NASA-SP-7037[74]] N77-11967
EXPERIMENTAL DESIGN
Laboratory procedure for the potential heat determination in solid wastes
[PB-256378/1] N77-12586
EXPLODING WIRES
Exploding wire shock test facility
[AD-A024924] N77-12079
EXPONENTIAL FUNCTIONS
The behavior of the Pade table for the exponential
[AD-A025099] N77-12805
Classification rules for exponential populations: Two parameter case
[AD-A025181] N77-12811
EXPONENTS
Characteristic exponents and linear control problems
N77-12775
EXTERNAL COMBUSTION ENGINES
Experiments and analysis related to external burning for propulsion
[AD-A024984] N77-12128
EXTRATERRESTRIAL LIFE
On the habitability of Mars: An approach to planetary ecosynthesis
[NASA-SP-414] N77-12718
EXTREMELY LOW FREQUENCIES
Development of a superconducting ELF receiving antenna
[AD-A024666] N77-12319
Magnetosphere dynamics by localization of ultra low frequency waves
[CEPHAG-3/76] N77-12614
Metabolic rates in five animal populations after long-term exposure to sanguine/sea-farer ELF Electromagnetic fields in nature
[AD-A024955] N77-12668
EYE [ANATOMY]
Spectrally balanced chromatic landing approach lighting system
[NASA-CASE-ARC-10990-1] N77-12031
EYE MOVEMENTS
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 — reflex movements of the eye
[DRB-DR-225] N77-12671
The vestibular system for eye movement control
N77-12674
EYE PROTECTION
Visual aids and eye protection for the aviator
[AGARD-CP-191] N77-12708
Eye protection, protective devices and visual aids
N77-12709
Integration of aviators eye protection and visual aids
N77-12710
Protection from retinal burns and flashblindness due to atomic flash
N77-12711
USAF aviator classes. HGU-4/P: History and present state of development
N77-12712
Vision with the AN/PVS-5 night vision goggle
N77-12715

F

F REGION
Satellite beacon data reduction and analysis
[AD-A025329] N77-12617
F-4 AIRCRAFT
Analysis of dynamic aircraft response to bomb damage repair
[AD-A025647] N77-12047
F-100 AIRCRAFT
Evaluation of augmenter light-off detection systems
[AD-A025321] N77-12061
F-111 AIRCRAFT
F-111a wing fatigue test program
[AD-A025795] N77-12049
FACE [ANATOMY]
Computer-produced faces as an iconic display for complex data
N77-12720
FACTOR ANALYSIS
Improving the reliability of factor analysis of chemical data by utilizing the measured analytical uncertainty
[AD-A025951] N77-12169
Encoding reduction and classification of two-dimensional data by factor analysis techniques
N77-12738
FAILURE ANALYSIS
A replacement policy for components of a pure series system utilizing one component as an indicator of replacement time
[AD-A024979] N77-12825
FAILURE MODES
Electronic components: A survey of the most used component types, their characteristic data, applications and failure rates
[ECR-62] N77-12293
FAR FIELDS
In-flight far-field measurement of helicopter impulsive noise
[AD-A025979] N77-12060
FAR INFRARED RADIATION
Support of the infrared radiometer on the ST
[NASA-CR-144818] N77-12361
FAST FOURIER TRANSFORMATIONS
An approach of developing fast transform algorithms
[AD-A024665] N77-12762
FATIGUE [MATERIALS]
Fatigue of notched fiber composite laminates. Part 2: Analytical and experimental evaluation
[NASA-CR-145039] N77-12133
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy
N77-12178
Fatigue crack growth in aluminum alloys
[AD-A025196] N77-12207
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430
Fatigue under combined out of phase multiaxial stresses — for carbon steel
N77-12431
Speckle pattern correlation method for measurement of surface structural changes caused by fatigue
N77-12433
FATIGUE LIFE
Preliminary evaluation of fatigue life gages used for beam life prediction
[AD-A024811] N77-12375
Scanning electron microscopy, ion scattering and secondary ion mass spectrometry to characterize apparent adhesive failure in an adhesive bond
[AD-A025615] N77-12442
An empirical design procedure for shafts with fatigue loadings
[AD-A024785] N77-12457
FATIGUE TESTS
F-111a wing fatigue test program
[AD-A025795] N77-12049
FEASIBILITY ANALYSIS
The feasibility of solar energy usage on Red River Army Depot
[AD-A025119] N77-12535
FERROCENES
Zonal energetics balances for the melting of carbon ferrochromium
[NLL-M-25334-[5828.4F]] N77-12176
FERROELECTRICITY
Investigation of anharmonic self-energies in some ionic and displacive ferroelectric solids
N77-12882
FERROMAGNETIC FILMS
Thick and thinfilm inductors: An investigation of design and manufacturing parameters for VHF and UHF inductors made in film techniques
[ECR-64] N77-12296
FIBER OPTICS
The parabolic cylinder functions of Miller's second kind for complex parameter
[AD-A025314] N77-12801
FIGHTER AIRCRAFT
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430
Eye protection, protective devices and visual aids
N77-12709
FILTRATION
Hydrodynamic separation of solids from solid-liquid mixtures
[PB-254490/6] N77-12938
FINANCIAL MANAGEMENT
Financial critical factors analysis — waste treatment management for Miami Valley, Ohio region
[PB-254377/5] N77-12937
FINITE DIFFERENCE THEORY
A consistent finite-difference operator for time-dependent solution of steady, oblique shocks
[KTH-AERO-FI-47] N77-12331
On the computation of strongly underexpanded supersonic submerged jets
N77-12343
Finite difference energy techniques for arbitrary meshes applied to linear and nonlinear problems with irregular domains
N77-12428
FINITE ELEMENT METHOD
Finite element method for through-flow calculations
N77-12018
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
Finite element simulation of weldbonded joint deformation
[PB-256995/2] N77-12455
FIRE FIGHTING
Evaluation of radio communications for use by individual fire fighters
[AD-A025936] N77-12273
FLAME IONIZATION
The use of a prototype cryogenic gas chromatograph in combination with PTGC for analysis of inorganic and organic gases: Application to air pollution studies
N77-12144
FLAME PROPAGATION
Investigations into new methods of analysis by atomic and molecular fluorescence and flame emission
N77-12150
FLAME STABILITY
Evaluation of augmenter light-off detection systems
[AD-A025321] N77-12061
FLAPS [CONTROL SURFACES]
An experimental investigation of the flap-lag stability of a hingeless rotor with comparable levels of hub and blade stiffness in hovering flight
[NASA-CR-151924] N77-12040
FLASH BLINDNESS
Protection from retinal burns and flashblindness due to atomic flash
N77-12711
FLAT PLATES
DFVLR/AEDC cooperative thermal vacuum test 3
[AD-A024778] N77-12237
Dynamic interaction of shells and plates with the ambient medium
N77-12432
Flat-plate solar collector handbook. A survey of principles, technical data and evaluation results
[UCID-17086] N77-12506
MHD oscillatory flow past a semi-infinite flat plate
N77-12876
FLIGHT ALTITUDE
The effect of various air density-altitude relations on the phugoid
[NASA-TT-F-17118] N77-11990
FLIGHT CHARACTERISTICS
Army preliminary evaluation JOH-58A helicopter with low reflective paint and infrared countermeasure exhaust system
[AD-A024727] N77-12042
FLIGHT CONTROL
Investigation of the use of an electronic multifunction display and an electromechanical horizontal situation indicator for guidance and control of powered-lift short-haul aircraft
[NASA-CR-137922] N77-12055
FLIGHT CREWS
Aeromedical review of oxygen requirements of US Army aviators
[AD-A024726] N77-12688
FLIGHT FITNESS
Flight fitness and pliant contact lenses
N77-12714
FLIGHT HAZARDS
Eye protection, protective devices and visual aids
N77-12709
FLIGHT INSTRUMENTS
Pilot opinion of flight displays and monitoring gauges in the UH-1 helicopter
[AD-A024714] N77-12579
An analysis of the effect of a flight director on pilot performance in a helicopter hovering task
[AD-A025680] N77-12701

FLIGHT RULES
Code of federal regulations. 14. Aeronautics and space, parts 1 to 59 --- federal aviation procedural rules and standards
N77-12932
Code of federal regulations. 14. Aeronautics and space, parts 60 to 199 --- federal aviation procedural rules and standards
N77-12933

FLIGHT SIMULATION
Validation of the rotorcraft flight simulation program [C81] for articulated rotor helicopters through correction with flight data
[AD-A025934] N77-12045

FLIGHT SIMULATORS
Design studies of a motion system for the VTOL simulation facility
[AD-A024732] N77-12075
Feasibility of implementing specific performance measurement techniques
[AD-A025945] N77-12705

FLIGHT TESTS
Airworthiness and flight characteristics evaluation: YAH-1S improved Cobra agility and maneuverability helicopter
[AD-A025476] N77-12043
Development of a tow capability for the HH-3F helicopter
[AD-A025790] N77-12050

FLORIDA
Planning applications in east central Florida
[E77-10044] N77-12474

FLOW DISTORTION
Analysis of pressure distortion testing
[NASA-CR-2766] N77-12041

FLOW DISTRIBUTION
Picking up and graphing of three dimensional flow fields
N77-11986
Through-flow calculations in axial turbomachinery
[AGARD-CP-195] N77-12013
Through-flow calculations based on matrix inversion: Loss prediction
N77-12016
Through-flow calculations: Theory and practice in turbomachinery design
N77-12017
Three-dimensional flow calculation for a transonic compressor rotor
N77-12019
Through-flow calculation procedures for application to high speed large turbines
N77-12020
Design of turbine, using distributed or average losses; effect of blowing
N77-12021
A critical review of turbine flow calculation procedures
N77-12022
Compressor design and experimental results
N77-12023
Comparison between the calculated and the experimental results of the compressor test cases
N77-12024
Turbine test cases: Presentation of design and experimental characteristics
N77-12025
Effect of the constrictive area ratio on the rocket exhaust flow-field in the launcher
[AD-A024657] N77-12127
Calculation of transonic flows using an extended integral equation method
[NASA-TM-X-74227] N77-12335
Secondary gas injection into a supersonic conical nozzle --- induced flow distribution
N77-12336
Mean flow and turbulence measurements in the wake of slender propeller-driven bodies including effects of pitch angle
[AD-A031088] N77-12337

FLOW EQUATIONS
Through-flow calculations in axial turbomachinery: A technical point of view
N77-12015
Through-flow calculations: Theory and practice in turbomachinery design
N77-12017
Finite element method for through-flow calculations
N77-12018
Comparison between the calculated and the experimental results of the compressor test cases
N77-12024

FLOW MEASUREMENT
Models for calculating flow in axial turbomachinery
N77-12014

FLOW STABILITY
A program for the stability analysis of pipe Poiseuille flow
[AD-A024927] N77-12351

FLOW VELOCITY
Similar solutions of the differential equations for mean velocities, turbulence energy and turbulence length
[ESA-TT-354] N77-12339
Flow of solid particles in gases: Activities at the Von Karman Institute for Fluid Dynamics
N77-12356

FLOW VISUALIZATION
Wind tunnel models for aero-optical interaction study
[AD-A024925] N77-12078
Flow visualization of the turbulent jet at the exit of a single element nozzle by holographic technique, and mean velocity profile measurements with a laser Doppler anemometer
[AD-A025439] N77-12348

FLUID DYNAMICS
User's manual: Supersonic unsteady cascade program, volume 2
[AD-A025186] N77-12012
Analyses of ACPL thermal/fluid conditioning system
[NASA-CR-149166] N77-12333
Analysis of supersonic unsteady cascades with the method of characteristics, volume 1
[AD-A025909] N77-12342
The numerical solution of the steady flow of Newtonian and non-Newtonian fluids through a contraction
[AD-A025774] N77-12344
Transonic two-dimensional flow analysis of compressor cascade with splitter vanes
[AD-A025921] N77-12347

FLUID FLOW
An empirical technique for predicting flow curves
N77-12327
A review of research in the United Kingdom in the field of multiple flows of solids and gases
N77-12355

FLUID TRANSMISSION LINES
Deposition of suspensions in laminar flow
[AD-A025886] N77-12341

FLUORESCENCE
Investigations into new methods of analysis by atomic and molecular fluorescence and flame emission
N77-12150
Studies into tunable-laser-excited atomic fluorescence spectrometry
N77-12381
Luminescence properties of cyclic polynitramines
N77-12850

FLUORIDES
Experimental and theoretical investigation of the thermodynamic properties of sulfur hexafluoride in the liquid phase
[AD-A024986] N77-12919

FLUORINE
The superhyperfine structure of a system exhibiting the dynamic Jahn-Teller effect: CaF2:Sc[2+]
N77-12846

FLUORINE COMPOUNDS
A survey of kinetic data of compounds containing flourine
[NASA-TM-X-73983] N77-12609

FLUORITE
Thermodynamic, structural and transport properties of some fluorite solid electrolytes
N77-12892

FLUORSPAR
The superhyperfine structure of a system exhibiting the dynamic Jahn-Teller effect: CaF2:Sc[2+]
N77-12846

FLUX DENSITY
Spectral effects on cross-sectional reconstruction from X-rays
N77-12855

FLYBY MISSIONS
Solar out-of-ecliptic study. Volume 1: Executive summary --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-1] N77-12087

FLYWHEELS
Mechanical damping of flywheel stabilization systems
N77-12404
Increased fuel economy in transportation systems by use of energy management: Second year's program. Executive summary
[PB-256117/3] N77-12536

FOG DISPERSAL
Heat and thrust requirements of a thermal fog dispersal system
[AD-A025112] N77-12648

FOKKER-PLANCK EQUATION
A method for the analysis of nonlinearities in aircraft dynamic response to atmospheric turbulence
[NASA-TN-D-8265] N77-11992

FOREARM
The behaviour of skin temperature profiles in the forearm of a nude resting subject at air temperatures from 24 C to 34 C
[REPT-69] N77-12681

FOREBODIES
Transonic stability and control characteristics of a 0.015 scale model 69-0 of the space shuttle orbiter with forebody RSI modification in the NASA/LaRC 8 foot TPT [LA72]
[NASA-CR-147644] N77-12108

FORGING
Improvement of reliability and the mechanical properties of titanium alloy forgings
[AD-A025479] N77-12197
Variation of mechanical properties in large steel forgings
[AD-A025807] N77-12208

FORTRAN
OPTRIN and OPTAPE: Programs for interchange of data between REMAPP and the OPTRONICS P-1700 system
[PB-256692/5] N77-12760

FOSSIL FUELS
Fuel contaminants. Volume 1: Chemistry
[PB-256020/9] N77-12231
Proceedings of the Mineral Economics Symposium: Winning the high stakes at the critical commodity game
[PB-255607/4] N77-12502

FOUNDATIONS
Pretest prediction of dynamic structural response to ground motion event ESSEX-5
[AD-A023911] N77-12440

FOURIER ANALYSIS
Fourier analysis and the correlation of speed with nonstationary aerodynamics
N77-11985

FOURIER TRANSFORMATION
WKB expansions by path integrals, with applications to the anharmonic oscillator
[AD-A025440] N77-12918

FRACTOGRAPHY
Fractographic evaluation of fracture specimens
[AD-A025746] N77-12194

FRACTURE MECHANICS
Interlaminar strength of laminated polymeric matrix composites
[AD-A024722] N77-12138
An assessment of the fracture resistance of three chopped-fiber reinforced phenolic materials
[AD-A024672] N77-12142
Development and application of an interferometric system for measuring crack displacements
[NASA-CR-145106] N77-12367
Theoretical analysis of ATJS graphite disks fractured by spinning
[AD-A024711] N77-12451
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
A survey of fracture mechanics applications in the United States
[AD-A024715] N77-12463

FRACTURE STRENGTH
Segregation effects and the toughness of high-strength steels
[AD-A025299] N77-12190
The influence of heat treatment on the structure and properties of an isothermally forged Ti6-Al-6V-2Sn nose wheel and structural shape
[AD-A025473] N77-12195
Fracture toughness of pressure vessel materials for light water reactors
[AD-A025808] N77-12461

FRACTURES [MATERIALS]
Fracture of composite orthotropic plates containing periodic buffer strips
N77-12131

FRENCH SATELLITES
General operations program Signe 3
[NASA-TT-F-16760] N77-12096

FRENCH SPACE PROGRAMS
French space program. Report to COSPAR --- covering mid-1975 to mid-1976 period
N77-12086

FRENKEL DEFECTS
Contribution to Frenkel condensation theory
N77-12899

FREON
Correlation of full-scale helicopter rotor performance in air with model-scale Freon data
[NASA-TN-D-8323] N77-11999

FREQUENCY CONVERTERS
Single channel monopulse converter
[AD-A025485] N77-12117
Follow-up filter
[CEPHAG-23/75] N77-12299

FREQUENCY DISTRIBUTION
An assessment of prewhitening in estimating power spectra of atmospheric turbulence at long wavelengths
[NASA-TN-D-8288] N77-12610

FREQUENCY MODULATION
Equipment compliance report for AN/URC-78[XE-1]/V. Volume 4: Service condition test report
[AD-A025667] N77-12279

FRICTION MEASUREMENT
Pavement surface dynamics friction measurement and analysis in Kansas
[PB-255490/5] N77-12459

FUEL CELLS
Optimization of PT-doped Kocite [trademark] electrodes in H3 PO4 fuel cells
[AD-A025326] N77-12529

FUEL CONSUMPTION
California energy outlook
[UCRL-5196-REV-1] N77-12525
Impacts of synthetic liquid fuel development. Automotive market. Volume 1: Summary
[PB-255994/6] N77-12533
Impacts of synthetic liquid fuel development. Automotive market. Volume 2
[PB-255995/3] N77-12534
Increased fuel economy in transportation systems by use of energy management: Second year's program. Executive summary
[PB-256117/3] N77-12536

FUEL CONTAMINATION
Fuel contaminants. Volume 1: Chemistry
[PB-256020/9] N77-12231

FUEL OILS
Crude oil supply alternatives for the Northern Tier states
[PB-255991/2] N77-12530

FUEL TANKS
Numerical analysis of fuel tank penetration dynamics
[AD-A025451] N77-12448
A study of the crack damage in fuel-filled tank walls due to ballistic penetrators
[AD-A025430] N77-12449

FUNCTION SPACE
WKB expansions by path integrals, with applications to the anharmonic oscillator
[AD-A025440] N77-12918

FUNCTIONS [MATHEMATICS]
Approximating functions for earth atmospheric density
[NASA-TT-F-17107] N77-12608
Notes on the computation of the generalized zeta and digamma functions with programs and tables
[AD-A025134] N77-12707
The exchange partition functions of the rigid asymmetric top N77-12784
Applied mathematics
[AD-A025791] N77-12807

FURNACES
General purpose rocket furnace
[NASA-CASE-MFS-23460-1] N77-12070

FUSELAGES
Measurement of the static influence coefficient of the AH-1G Cobra fuselage
[AD-A025114] N77-12044

G

GALAXIES
A high angular resolution study of the neutral hydrogen in the IrrII galaxy M82
[AD-A024806] N77-12985

GALERKIN METHOD
Analytical comparison of effects of solid-friction and viscous structural damping on panel flutter
[NASA-TN-D-8263] N77-12435

GALLIUM ARSENIDE LASERS
Gallium arsenide - gallium alluminum arsenide distributed feedback and distributed Bragg reflector lasers N77-12384

GALLIUM ARSENIDES
High-efficiency thin-film GaAs solar cells
[PB-255821/1] N77-12550

GAS CHROMATOGRAPHY
The use of a prototype cryogenic gas chromatograph in combination with PTGC for analysis of inorganic and organic gases: Application to air pollution studies N77-12144
Laser pyrolysis gas chromatography and plasma stoichiometric analysis N77-12145
Investigations of column packing materials for gas solid chromatography N77-12147

GAS COMPOSITION
Application of coherent anti-Stokes Raman scattering to measurements of gas concentrations in aerodynamic flows
[ESA-TT-331] N77-12160
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
Measurement of gaseous minor constituents in the natural stratosphere --- to predict stratospheric pollution by supersonic aircraft flight
[ESA-TT-337] N77-12615

GAS DISSOCIATION
Electrostatic calculations in membrane systems N77-12146

GAS FLOW
Flow of solid particles in gases
[AGARD-AG-222] N77-12352
Gas flows with solid particles: Research and development in Germany N77-12354
A review of research in the United Kingdom in the field of multiple flows of solids and gases N77-12355
Flow of solid particles in gases: Activities at the Von Karman Institute for Fluid Dynamics N77-12356
Fundamentals and applications of gas-particle flow N77-12357

GAS GENERATORS
Rocket engine assemblies and gas generator plenum
[AD-A025932] N77-12125
Development of hydrazine gas generator/plenum system
[AD-A025931] N77-12126
Solid propellants for hydrogen gas generators
[AD-A025974] N77-12235

GAS INJECTION
Secondary gas injection into a supersonic conical nozzle --- induced flow distribution N77-12336

GAS IONIZATION
Thermochemistry of gaseous metal oxides
[AD-A025661] N77-12164

GAS LASERS
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387

GAS MIXTURES
Visible wavelength chemiluminescence initiated by CO2 laser radiation
[AD-A025002] N77-12170
French contribution to aerodynamics of gas-particle mixtures N77-12353

GAS TURBINE ENGINES
Turbine test cases: Presentation of design and experimental characteristics N77-12025
Emissions and performance of catalysts for gas turbine catalytic combustors
[NASA-TM-X-73543] N77-12406

GAS-METAL INTERACTIONS
A search for chemical laser action in low pressure metal vapor flames N77-12380

GASDYNAMIC LASERS
Development and application of a low cost gas dynamic laser test facility
[AD-A025648] N77-12074
A study of boundary layer and mass bleed in a short length supersonic diffuser for a gas dynamic laser
[AD-A025673] N77-12394

GASEOUS DIFFUSION
Purging of a multilayer insulation with dacron tuft spacer by gas diffusion
[NASA-TM-X-3456] N77-12099

GASES
Measurement of excitation functions for charged particle reactions with gases N77-12875

GEOCHRONOLOGY
Contributions to paleomagnetism and rb-sr geochronology N77-12605

GEODESY
Covariance expressions for second and lower order derivatives of the anomalous potential
[AD-A024720] N77-12626

GEOLOGY
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243

GEOPHYSICAL OBSERVATORIES
Automatic meteorological observations in Northern Greenland
[P-62] N77-12642

GEOPOTENTIAL
The theory of the gravitational potential applied to orbit prediction
[NASA-TM-X-58186] N77-12092
Covariance expressions for second and lower order derivatives of the anomalous potential
[AD-A024720] N77-12626

GEOTHERMAL RESOURCES
Remote sensing of geothermic activities of the volcanoes Aetna, Stromboli and Vesuv by means of infrared NOAA-VHRR-satellite data --- Italy N77-12485

GERMANIUM
High-efficiency thin-film GaAs solar cells
[PB-255821/1] N77-12550
Investigation of the absorption coefficients of Ge and MgF2 in the ultraviolet, visible, and near-infrared spectrum ranges in the 300 - 800 K band N77-12856

GERMANY
Annals of meteorology no. 10: Development of meteorological observations in northern and central Germany up to 1700
[ISBN-3-88148-145-1] N77-12641
Superconductivity: A changing R and D scene in Germany
[AD-A025445] N77-12906
Max Valier: A pioneer of space travel
[NASA-TT-F-664] N77-12993

GLARE
Experimental study of vision dimming in an animal N77-12716

GLASS
Manufacturing unique glasses in space
[NASA-CR-150067] N77-12083
Processing FeB03 glass-ceramics in space
[NASA-CR-150068] N77-12084
Preparation and magnetic properties of titanium phosphate glass N77-12213
Structural relaxation of enthalpy and heat capacity of As2Se3 glass
[AD-A025018] N77-12229

GLASS COATINGS
Reliability of deposited glass
[AD-A024664] N77-12226

GLASS FIBER REINFORCED PLASTICS
Environmental effects on the strength of a glass fiber-reinforced-plastic rod material
[PB-256296/5] N77-12224

GLASS FIBERS
Research and development in glass technology related to fiber optic waveguides
[AD-A025660] N77-12867

GOGGLES
Visual aids and eye protection for the aviator
[AGARD-CP-191] N77-12708
Protection from retinal burns and flashblindness due to atomic flash N77-12711
USAF aviator classes. HGU-4/P: History and present state of development N77-12712
Vision with the AN/PVS-5 night vision goggle N77-12715
Lens material evaluation [goggles, sun, wind, and dust]
[AD-A025778] N77-12860

GOVERNMENT PROCUREMENT
A computer model for estimating development and procurement costs of aircraft DAPCA-III
[AD-A025276] N77-12929

GOVERNMENT/INDUSTRY RELATIONS
An overview of Federal technology transfer
[PB-255693/4] N77-12953

GRAIN BOUNDARIES
On the embrittlement of grain boundaries by impurities
[AD-A024940] N77-12206

GRAPHITE
Advanced composite rudders for DC-10 aircraft: Design, manufacturing, and ground tests
[NASA-CR-145068] N77-12039
Effect of low velocity impact damage on the compressive strength of graphite/epoxy hat-stiffened panels
[NASA-TM-X-73988] N77-12134
Bonding of elevated temperature strain gages to humid aged graphite tensile specimens through the use of anaerobic adhesives
[AD-A025920] N77-12223
Theoretical analysis of ATJS graphite disks fractured by spinning
[AD-A024711] N77-12451

GRAPHS [CHARTS]
Efficient algorithms for chordal graphs and interval graphs N77-12742

GRATINGS [SPECTRA]
Low efficiency diffraction grating theory
[AD-A024804] N77-12866

GRAVITATIONAL FIELDS
The theory of the gravitational potential applied to orbit prediction
[NASA-TM-X-58186] N77-12092

GRAVITY GRADIENT SATELLITES
Passive attitude stabilization of satellites --- magnetic and gravity gradient methods
[VTH-176] N77-12100

GREAT PLAINS CORRIDOR [NORTH AMERICA]
The Large Area Crop Inventory Experiment [LACIE]
[NASA-TM-X-74225] N77-12480
Large Area Crop Inventory Experiment [LACIE]. Phase 1: Evaluation report
[NASA-TM-X-74226] N77-12481

GREAT SALT LAKE [UT]
Development of a water quality simulation model applicable to Great Salt Lake, Utah
[PB-255718/9] N77-12596

GREENLAND
Automatic meteorological observations in Northern Greenland
[P-62] N77-12642

GROUND EFFECT MACHINES
Velocity measurements on the aerodynamic wake of a hovercraft using laser Doppler anemometry
[UTIAS-TN-203] N77-12010
Waves generated by a uniformly moving oscillatory surface effect ship
[AD-A025129] N77-12011

GROUND STATE
Variational calculations with hyperspherical basis sets on atomic helium and lithium
N77-12839
Kondo and magnetic ordering behavior in singlet ground state systems
N77-12891
GROUND STATIONS
Report from space
[NASA-TT-F-17504] N77-12482
GROUND TRUTH
Large Area Crop Inventory Experiment [LACIE]. Phase 1: Evaluation report
[NASA-TM-X-74226] N77-12481
GROUND WATER
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495
Toxic heavy metals in groundwater of a portion of the front range mineral belt
[PB-256212/2] N77-12582
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs
[PB-256564/6] N77-12939
Systematic development of methodologies in planning urban water resources for medium size communities phase 1
[PB-256565/3] N77-12940
GROUP THEORY
A subgradient procedure for the solution of minimax location problems
[AD-A025288] N77-12796
Purity and imbeddedness in Abelian torsion groups
N77-12826
Symbolic transformation groups
N77-12827
GUNS [ORDNANCE]
Variation of mechanical properties in large steel forgings
[AD-A025807] N77-12208
GYROSCOPES
Ball bearings for gyroscope axis. Simple movements of the retainer
[LRBA-E-602-NT-49/SIE] N77-12408
GYROSCOPIC STABILITY
Stability analysis of extended gyrostats
N77-12829

H

HABITABILITY
On the habitability of Mars: An approach to planetary ecosynthesis
[NASA-SP-414] N77-12718
HABITUATION [LEARNING]
Motion sickness incidence: Exploratory studies of habituation, pitch and roll, and the refinement of a mathematical model
[AD-A024709] N77-12689
HALIDES
Axial effects in planar complexes: Iron tetraphenylporphyrinrin and nickel bisdiphenylglyoxime halides
N77-12890
HALITES
A survey of salt deposits and salt caverns: Their relevance to the strategic petroleum reserve
[PB-255948/2] N77-12500
HAMILTONIAN FUNCTIONS
The superhyperfine structure of a system exhibiting the dynamic Jahn-Teller effect: CaF2:Sc[2+]
N77-12846
HANDBOOKS
Flat-plate solar collector handbook. A survey of principles, technical data and evaluation results
[UCID-17086] N77-12506
Quality assurance handbook for air pollution measurement systems. Volume 1: Principles
[PB-254658/8] N77-12567
HARDENING [MATERIALS]
Hardening characteristics of TI-6AL-2SN-4ZR-6MO alloy
[AD-A025307] N77-12191
HARDENING [SYSTEMS]
The feasibility of a storable propellant turbine/high-speed alternator as a compact short-life power system for hardened ballistic missile defense [BMD] installations
[AD-A024786] N77-12543
HARMONIC FUNCTIONS
Uniform approximation of continuous functions on open subsets of R to the m power
N77-12786
HARTREE APPROXIMATION
Quantum mechanical analysis of intramolecular interactions
N77-12838
HAWAII
Water resources data for Hawaii and other Pacific areas, water year 1975
[PB-256668/5] N77-12497
HEAD [ANATOMY]
A model for analytic investigation of three-dimensional head-spine dynamics
[AD-A025911] N77-12686
A prediction of response of the head and neck of US adult military population to dynamic impact acceleration from selected dynamic test subjects
[AD-A025785] N77-12702
HEAD MOVEMENT
A free head-movement pupillometer system
[AD-A025900] N77-12698
HEAT MEASUREMENT
Laboratory procedure for the potential heat determination in solid wastes
[PB-256378/1] N77-12586
HEAT PIPES
Heat pipe materials compatibility
[NASA-CR-135069] N77-12182
HEAT PUMPS
Evaluation of the air-to-air heat pump for residential space conditioning
[PB-255652/0] N77-12545
HEAT RADIATORS
Development of a self contained heat rejection module, phase 2 and 3
[NASA-CR-151109] N77-12068
HEAT STORAGE
Thermal energy storage material thermophysical property measurement and heat transfer impact
[NASA-CR-135098] N77-12510
Outdoor performance results for NBS Round Robin collector no. 1
[NASA-TM-X-73547] N77-12520
Temperature distribution of a hot water storage tank in a simulated solar heating and cooling system
[NASA-TM-X-73549] N77-12521
HEAT TRANSFER
Fluid cooling of high power density semiconductor devices
[AD-A025815] N77-12314
Analyses of ACPL thermal/fluid conditioning system
[NASA-CR-149166] N77-12333
Reflood heat transfer in a light water reactor
[PB-256481/3] N77-12345
Unsteady transonic flow with heat addition due to condensation
[AD-A025651] N77-12350
Selected aspects of waste heat management
[PB-254401/3] N77-12568
HEAT TRANSFER COEFFICIENTS
Heat transfer and carryover of low pressure water in a heated vertical tube
[PB-256480/5] N77-12346
HEAT TREATMENT
The influence of heat treatment on the structure and properties of an isothermally forged Ti6-Al-6V-2Sn nose wheel and structural shape
[AD-A025473] N77-12195
Improvement of reliability and the mechanical properties of titanium alloy forgings
[AD-A025479] N77-12197
HEATING
Unsteady transonic flow with heat addition
[AD-A024737] N77-12340
Evaluation of the air-to-air heat pump for residential space conditioning
[PB-255652/0] N77-12545
HEATING EQUIPMENT
Heat and thrust requirements of a thermal fog dispersal system
[AD-A025112] N77-12648
HELICOPTER CONTROL
A parametric analysis of visual approaches for helicopters
[NASA-TN-D-8275] N77-12066
An analysis of the effect of a flight director on pilot performance in a helicopter hovering task
[AD-A025680] N77-12701
HELICOPTER DESIGN
Advanced helicopter structural design investigation. Volume 1: Investigation of advanced structural component design concepts
[AD-A024662] N77-12052
HELICOPTER PERFORMANCE
A parametric analysis of visual approaches for helicopters
[NASA-TN-D-8275] N77-12066
HELICOPTER TAIL ROTORS
Validation of the rotorcraft flight simulation program [C81] for articulated rotor helicopters through correction with flight data
[AD-A025934] N77-12045
HELICOPTERS
Measurement of the static influence coefficient of the AH-1G Cobra fuselage
[AD-A025114] N77-12044
High-survivable transmission system
[AD-A025930] N77-12046
Development of a tow capability for the HH-3F helicopter
[AD-A025790] N77-12050
A new capability for predicting helicopter rotor noise in hover and in flight
[NASA-CR-147138] N77-12064
Aeromedical review of oxygen requirements of US Army aviators
[AD-A024726] N77-12688
HELIUM
The clustering of O2 and He to Li[+]
[AD-A025762] N77-12625
Variational calculations with hyperspherical basis sets on atomic helium and lithium
N77-12839
HELMETS
Integration of aviators eye protection and visual aids
N77-12710
HELMHOLTZ VORTICITY EQUATION
Inlet total pressure loss due to acoustic wall treatment
[NASA-TM-X-73559] N77-11991
HERMETIC SEALS
Outdoor evaluation: Study means of assuring MIL-D-6054 steel drums are hermetically sealed
[AD-A025809] N77-12418
HEURISTIC METHODS
On-line virtual architecture tuning using microcapture
N77-12741
Solving nearby integer programs
[AD-A025606] N77-12797
Worst-case analysis of a new heuristic for the travelling salesman problem
[AD-A025602] N77-12799
HEWLETT-PACKARD COMPUTERS
A visual display system for the HP 2100A computer
[R-1-76] N77-12723
Position-fixing and position-predicting programs for the Hewlett-Packard model 9830A programmable calculator
[AD-A024972] N77-12751
HIERARCHIES
FORESTER: A language for morphological analysis of hierarchical systems, with reference to structural exegesis of the synoptic traditions
N77-12740
HIGH ENERGY INTERACTIONS
Spin dependence at very high energies in an eikonal picture of pp elastic scattering
N77-12842
HIGH FREQUENCIES
The maximum liklihood method applications to DAASM studies
[AD-A025223] N77-12258
The horizontally polarized dipole antenna as a solution to the problems of high frequency short range communications
[AD-A025674] N77-12277
HIGH PASS FILTERS
Follow-up filter
[CEPHAG-23/75] N77-12299
HIGH PRESSURE
Design, construction and evaluation of a high pressure, high electric field optoacoustic detector
[AD-A025772] N77-12864
Semiconductors under high pressure
[AD-A025323] N77-12897
HIGH RESOLUTION
Analytical applications of a high resolution echelle monochromator
N77-12151
Remote sensing of variations of sea-ice-surfaces in the Barents-Sea from 1966 - 1975 by means of satellite data, among others NOAA-VHRR
N77-12484
HIGH SPEED
Evaluation techniques for ball bearings using a high speed test bench
[LRBA-E-602-NT-42/SIE] N77-12407
Graphic display unit for the IBM 7040 computer of the Higher Institute of Health
[ISS-T-75/2] N77-12724
HIGH STRENGTH ALLOYS
High strength-high damping capacity wrought magnesium alloys
[AD-A025164] N77-12212
HIGH STRENGTH STEELS
Formation of an impeded recrystallization zone during the annealing of low-alloy molybdenum alloys
[NLL-M-25349-[5828.4F]] N77-12174
Segregation effects and the toughness of high-strength steels
[AD-A025299] N77-12190
HIGH TEMPERATURE
Modified GRAY: An improved three-phase equation of state for metals
[AD-A025260] N77-12192
A computer program for the calculation of relative emission coefficients of diatomic molecules in the high temperature range
[ESA-TT-300] N77-12914
HIGH TEMPERATURE GASES
Effect of a chromium-containing fuel additive on hot corrosion
[NASA-TM-X-73465] N77-12184
HIGHWAYS
Instrumentation and equipment for testing highway materials, products, and performance
[PB-256138/9] N77-12377

Air quality considerations in transportation planning: Findings and recommendations on transportation control planning, phase 2
[PB-256424/3] N77-12576
Implementation of proven technology in making the highway environment safe
[PB-256664] N77-12950
HOLOGRAMMETRY
The role of charge transport in the formation and erasure of volume phase holograms in electrooptic lithium niobate
N77-12359
HOLOGRAPHIC INTERFEROMETRY
Holographic interferometer background fringe reduction by dual vacuum application
[AD-A024741] N77-12379
HOLOGRAPHY
Flow visualization of the turbulent jet at the exit of a single element nozzle by holographic technique, and mean velocity profile measurements with a laser Doppler anemometer
[AD-A025439] N77-12348
HOT PRESSING
Fabrication and evaluation of hot isostatically pressed beryllium
[AD-A024780] N77-12198
HOUSINGS
Urban and regional research in Sweden 1974-1975. An annotated list
[PB-256201/5] N77-12949
HOVERING
A new capability for predicting helicopter rotor noise in hover and in flight
[NASA-CR-147138] N77-12064
HOVERING STABILITY
An experimental investigation of the flap-lag stability of a hingeless rotor with comparable levels of hub and blade stiffness in hovering flight
[NASA-CR-151924] N77-12040
Airworthiness and flight characteristics evaluation: YAH-1S improved Cobra agility and maneuverability helicopter
[AD-A025476] N77-12043
An analysis of the effect of a flight director on pilot performance in a helicopter hovering task
[AD-A025680] N77-12701
HUMAN BEINGS
The collection, analysis, and comparison of human sensible perspiration between sedentary and conditioned male caucasians as to the variation in selected electrolyte composition
N77-12669
HUMAN BODY
Effects of acceleration on selected serum enzymes
[AD-A025965] N77-12691
Statistical concepts in design
[AD-A025750] N77-12699
HUMAN FACTORS ENGINEERING
Evaluation of radio communications for use by individual fire fighters
[AD-A025936] N77-12273
Worst-case analysis of a new heuristic for the travelling salesman problem
[AD-A025602] N77-12799
Digital color image processing and psychophysics within the framework of a human visual model
N77-12849
Design handbook for imagery interpretation equipment
[AD-A025453] N77-12869
HUMAN PATHOLOGY
Health implications of the risks connected with the use of americium 241 for lightning protection --- metabolism and pathological effects, and radioprotection
[ISS-R-75/16] N77-12684
HUMAN PERFORMANCE
The effect of continuous noise on short term memory performance tasks
[AD-A025446] N77-12694
HUMAN REACTIONS
Color inputs to orientation detectors in the human visual system
N77-12673
HUMIDITY
Influence of air humidity on compressor and turbine efficiency determined from experimental data
[NASA-TT-F-17073] N77-12057
HURRICANES
National hurricane operations plan
[PB-256824/4] N77-12657
HYDRAULIC CONTROL
Hydraulic functions of soils from physical experiments and their applications
N77-12471
HYDRAULIC EQUIPMENT
Hydraulic press: RDL Redcar
[PB-256050/6] N77-12414
HYDRAZINES
Development of hydrazine gas generator/plenum system
[AD-A025931] N77-12126
Catalytic deoxygenation of aqueous solution by hydrazine
[AD-A025794] N77-12233
HYDROCARBONS
Photochemical air pollution: Weekday-weekend differences
N77-12557
HYDRODYNAMICS
Control theory with applications to naval hydrodynamics: The First David W. Taylor Lectures, April 1972
[AD-A025702] N77-12778
Hydrodynamic separation of solids from solid-liquid mixtures
[PB-254490/6] N77-12938
HYDROFLUORIC ACID
Emission spectroscopical investigation of the system F2-H2 in a shock tube
[ESA-TT-349] N77-12161
HYDROGEN
Solid propellants for hydrogen gas generators
[AD-A025974] N77-12235
A high angular resolution study of the neutral hydrogen in the IrrII galaxy M82
[AD-A024806] N77-12985
HYDROGENATION
Synthesis and analysis of jet fuel from shale oil and coal syncrudes
[NASA-CR-135112] N77-12230
Clearance and saturation of hydrogen gas in man with special emphasis on the brain
[AD-A025952] N77-12692
HYDROLOGY
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495
HYDROXYL COMPOUNDS
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper [I] oxime imines of 2, 3-butanedione
N77-12889
HYDROXYL EMISSION
Intensity variations of atmospheric hydroxyl emissions
[AD-A025274] N77-12618
HYPERBOLIC DIFFERENTIAL EQUATIONS
Periodic solutions of nonlinear hyperbolic partial differential equations
N77-12793
HYPERSONIC FLOW
Investigation of boundary layer-like flows with pressure gradients at high freestream Mach numbers
[ESA-TT-348] N77-12338
HYPERSONIC SPEED
Scramjet nozzle design and analysis as applied to a highly integrated hypersonic research airplane
[NASA-TN-D-8334] N77-11994
HYPOBARIC ATMOSPHERES
Oxygen accumulation in hypobaric chambers
[AD-A025860] N77-12073

I

IBM 7040 COMPUTER
Graphic display unit for the IBM 7040 computer of the Higher Institute of Health
[ISS-T-75/2] N77-12724
IGNITION
Ignition phase blast field of tube or silo launched rockets: Inviscid, chemically reacting flow model
[AD-A025198] N77-12106
ILLUMINATING
The Basis for Effective Management of Lighting Energy
[PB-256070/4] N77-12544
IMAGE CONVERTERS
Engineering design criteria for an image intensifier/image converter camera
[NASA-CR-151112] N77-12365
IMAGE ENHANCEMENT
Imagery utilizing multiple focal planes
N77-12852
IMAGE INTENSIFIERS
Engineering design criteria for an image intensifier/image converter camera
[NASA-CR-151112] N77-12365
Effect of sun angle, atmospheric attenuation, and turbulence on mirror beacons for LANDSAT image control
[PB-255404/6] N77-12488
IMAGE MOTION COMPENSATION
Imagery utilizing multiple focal planes
N77-12852
IMAGES
Image descriptors for display
[AD-A024960] N77-12871
IMAGING TECHNIQUES
Orbiter description document for Jupiter Orbiter Probe 1981/1982 Mission
[NASA-CR-149244] N77-12097
Imagery utilizing multiple focal planes
N77-12852
Image quality through the atmosphere
N77-12853
Design handbook for imagery interpretation equipment
[AD-A025453] N77-12869
IMBEDDINGS [MATHEMATICS]
Purity and imbeddedness in Abelian torsion groups
N77-12826
IMINES
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper [I] oxime imines of 2, 3-butanedione
N77-12889
IMPACT ACCELERATION
A prediction of response of the head and neck of US adult military population to dynamic impact acceleration from selected dynamic test subjects
[AD-A025785] N77-12702
IMPACT DAMAGE
Effect of low velocity impact damage on the compressive strength of graphite/epoxy hat-stiffened panels
[NASA-TM-X-73988] N77-12134
IMPACT LOADS
Cumulative deflection and rigid pavement serviceability
[AD-A024969] N77-12077
Dynamic behavior of laminated polymeric matrix composites
[AD-A025622] N77-12135
Dynamic response of anisotropic laminated plates under initial stress to impact of a mass
[AD-A025906] N77-12445
IMPURITIES
Distribution of electron density in a transitional metal impurity in dilute substitution solid solutions
[NLL-M-25348-[5828.4F]] N77-12173
On the embrittlement of grain boundaries by impurities
[AD-A024940] N77-12206
Effect of inclusions on the mechanical behavior of beryllium
[AD-A025968] N77-12209
The behaviour of impurities in a steady-state DT gas-blanket reactor --- ion-ion and electron-ion collision contribution to Nernst effect
[REPT-75-90] N77-12877
IN-FLIGHT MONITORING
In-flight far-field measurement of helicopter impulsive noise
[AD-A025979] N77-12060
Development of a prototype experimental plan to evaluate stabilized optical viewing devices. 2: Inflight measures of airsickness potential
[AD-A025455] N77-12704
In-flight evaluation of hand-held optically stabilized target acquisition devices
N77-12717
INCLUSIONS
Effect of inclusions on the mechanical behavior of beryllium
[AD-A025968] N77-12209
INCOMPRESSIBLE FLOW
A program for the stability analysis of pipe Poiseuille flow
[AD-A024927] N77-12351
INCONEL [TRADEMARK]
Investigation of stress corrosion of Inconel 600 and Incoloy 800 for steam generators
[BLL-RISLEY-TR-3038-[9091.9F]] N77-12177
INDEXES [DOCUMENTATION]
Code of federal regulations. 14. Aeronautics and space, parts 1 to 59 --- federal aviation procedural rules and standards
N77-12932
Code of federal regulations. 14. Aeronautics and space, parts 60 to 199 --- federal aviation procedural rules and standards
N77-12933
Code of federal regulations. 14. Aeronautics and space, parts 200 to 1199 --- regulations and standards for the civil aeronautics board
N77-12934
INDIAN OCEAN
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 6, 1966
[KNMI-151-6] N77-12643
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 7, 1967
[KNMI-151-7] N77-12644
INDIANA
Systematic development of methodologies in planning urban water resources for medium size communities: Population characteristics and residential water use
[PB-256566/1] N77-12941
INDICATING INSTRUMENTS
Evaluation of augmenter light-off detection systems
[AD-A025321] N77-12061
INDIUM ARSENIDES
Resonance-enhanced allowed, field-induced and wave-vector-dependent Raman scattering from the surface region of InAs
N77-12887

INDIUM COMPOUNDS
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
INDUCTORS
Simplifier cut core inductor design
[NASA-CR-149241] N77-12292
Thick and thinfilm inductors: An investigation of design and manufacturing parameters for VHF and UHF inductors made in film techniques
[ECR-64] N77-12296
INDUSTRIAL MANAGEMENT
The development and Monte Carlo investigation of non-hierarchical clustering procedure, and its application to discrimination problems in industrial administration
N77-12812
INDUSTRIAL PLANTS
Engineering efficiency of high unit-capacity metallurgical units
[NLL-M-25379-[5828.4F]] N77-12175
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585
Data processing and industrial process control. Part 3: Numerical control [level 2 functions] and economic optimization [level 3 functions]
[CRIF-IN-3] N77-12776
INDUSTRIAL SAFETY
Laws and regulations affecting coal with summaries of Federal, State, and local laws and regulations pertaining to air and water pollution control, reclamation, diligence and health and safety, part 1
[PB-255927/6] N77-12592
INDUSTRIAL WASTES
Selected aspects of waste heat management
[PB-254401/3] N77-12568
Compliance status of major air pollution facilities
[PB-256653/7] N77-12588
INERTIAL GUIDANCE
Ball bearings for gyroscope axis. Simple movements of the retainer
[LRBA-E-602-NT-49/SIE] N77-12408
INERTIAL PLATFORMS
Micro navigator [MICRON] phase 2A. Volume 2: Technical report
[AD-A021526] N77-12033
INFORMATION DISSEMINATION
A plan for application system verification tests: The value of improved meteorological information, volume 1 --- economic consequences of improved meteorological information
[NASA-CR-149210] N77-12634
A plan for application system verification tests. The value of improved meteorological information, volume 2 --- economic consequence of improved meteorological information
[NASA-CR-149169] N77-12635
A plan for application system verification tests--The value of improved meteorological information: Executive summary --- economic consequence of improved meteorological information
[NASA-CR-149168] N77-12636
INFORMATION MANAGEMENT
An initial study of current and projected publishing technology pertinent to the Navy Technical Manual System [NTMS]
[AD-A025744] N77-12926
INFORMATION RETRIEVAL
SPARCOM: A sparse matrix associative relational approach to dynamic data structuring and data retrieval
N77-12921
Scientific and technical information needs of users or potential users of the DSA-administered, DoD Information Analysis Centers
[AD-A024937] N77-12928
INFORMATION SYSTEMS
Disease information system
[AD-A025477] N77-12732
Development of the Military Construction Data System [MCDS], part 2
[AD-A024938] N77-12736
INFRARED DETECTORS
Study of the effects of radiation on the electrical and optical properties of HgCdTe
[AD-A025222] N77-12257
Support of the infrared radiometer on the ST
[NASA-CR-144818] N77-12361
Silicon monolithic infrared detector array
[X76-1117/034A] N77-12858
The development of thin film photodetectors for the 8-14 micrometer atmospheric window
[AD-A025984] N77-12872
INFRARED LASERS
Far-infrared, chemical water lasers --- produced by flash photolysis
N77-12382
The spectral characteristics and atmospheric CO2 absorption of the Ho[+]3: YLF laser at 2.05 micrometers
[AD-A025618] N77-12386
Lithium iodate parametric oscillator
[AD-A025758] N77-12392
INFRARED RADIATION
Error analysis of minimum information and Smith's direct methods for inverting the radiative transfer equation
[AD-A025478] N77-12865
IR optical wave guide
[AD-A025953] N77-12874
INFRARED RADIOMETERS
High emissivity coatings for IR-temperature measurements
[ECN-15] N77-12366
INFRARED SPECTRA
Vapor phase spectra for air pollution studies
[AD-A025156] N77-12603
Technology and physics of infrared and point contact diodes
[AD-A025330] N77-12896
INFRARED SPECTROMETERS
High resolution 7 - 16 micron infrared spectrometry --- gas molecular spectroscopy, exemplified for methane and carbon dioxide
[ESA-TT-328] N77-12159
INFRARED SPECTROPHOTOMETERS
Geometric aspects of rocket photometry
[AD-A024947] N77-12629
INFRARED SPECTROSCOPY
Intensity variations of atmospheric hydroxyl emissions
[AD-A025274] N77-12618
Aerosol spectroscopy in the infrared
[AD-A025985] N77-12631
INFRARED TRACKING
Tracker backscatter study
[AD-A025768] N77-12391
INFRARED WINDOWS
Study of surface finishing and coating of DF laser windows
[AD-A025710] N77-12396
INJURIES
Review of present knowledge of plant injury by air pollution
[WMO-431] N77-12559
INLET PRESSURE
Inlet total pressure loss due to acoustic wall treatment
[NASA-TM-X-73559] N77-11991
INORGANIC COMPOUNDS
Structural defects in solids
N77-12894
INSPECTION
Investigation of the effect of inspection error on sequential sampling plans
[AD-A024760] N77-12427
INSTRUMENT APPROACH
A parametric analysis of visual approaches for helicopters
[NASA-TN-D-8275] N77-12066
INSTRUMENT COMPENSATION
Laboratory calibration of AAFE radiometer/scatterometer [RADSCAT]
[NASA-TM-X-73900] N77-12363
INSTRUMENT TRANSMITTERS
Image quality through the atmosphere
N77-12853
INTASAT SATELLITE
Use and analysis of the scientific data from the INTASAT satellite
[NASA-TT-F-16738] N77-12094
Report on one year's flight: INTASAT satellite project
[NASA-TT-F-16739] N77-12095
INTEGERS
Solving nearby integer programs
[AD-A025606] N77-12797
Representations of unbounded optimizations as integer programs
[AD-A025603] N77-12798
Symbolic transformation groups
N77-12827
INTEGRAL EQUATIONS
Calculation of transonic flows using an extended integral equation method
[NASA-TM-X-74227] N77-12335
The numerical solution of the eigenvalue problem for integral operators using the method of projections
N77-12781
INTEGRATED CIRCUITS
Reliability of deposited glass
[AD-A024664] N77-12226
An integrated system approach for automatic switching radio telephony
[AD-A024889] N77-12265
Advanced integrated-circuit technology for micropower ICs. Integrated circuits
[AD-A025507] N77-12303
Production engineering measure for an integrated circuit power amplifier 600 - 1000 MHz, for tactical radio equipment
[AD-A025919] N77-12307
Silicon monolithic infrared detector array
[X76-1117/034A] N77-12858
Reliability evaluation of C/MOS technology in complex integrated circuits
[AD-A024918] N77-12911
INTERFACES
Investigations of surfaces and interfaces using optical excitation of surface plasmons
[AD-A025285] N77-12162
INTERFEROMETERS
Development and application of an interferometric system for measuring crack displacements
[NASA-CR-145106] N77-12367
Laser interferometer techniques for inspection of optical components
[AD-A025088] N77-12385
INTERMODULATION
Intermodulation study --- in traveling wave tubes
[AD-A025689] N77-12315
INTERNAL COMBUSTION ENGINES
Applicability of spectrometric oil analysis to internal combustion engines: Initial phase of extended life test
[AD-A024743] N77-12168
INTERNATIONAL COOPERATION
Use and analysis of the scientific data from the INTASAT satellite
[NASA-TT-F-16738] N77-12094
INTERNATIONAL SYSTEM OF UNITS
Information on the metric system and related fields
[NASA-TM-X-3449] N77-12992
INTERPOLATION
Finite least squares collocation method
N77-12782
INTERSYMBOLIC INTERFERENCE
Moment space error bounds for digital communication systems with intersymbol interference based on nth moment
[AD-A025013] N77-12288
INVARIANCE
Invariant measures and its applications
N77-12792
INVENTORY CONTROLS
A replacement policy for components of a pure series system utilizing one component as an indicator of replacement time
[AD-A024979] N77-12825
INVERTERS
Advanced power processing techniques for DC to DC converters
[AD-A025915] N77-12306
INVISCID FLOW
Through-flow calculations based on matrix inversion: Loss prediction
N77-12016
ION BEAMS
Nonpropulsive applications of ion beams
[NASA-TM-X-73511] N77-12847
ION ENGINES
Pulsed thermionic converter study
[NASA-CR-149234] N77-12123
ION PROPULSION
Thermal-environment testing of a 30-cm engineering model thruster
[NASA-TM-X-73522] N77-12121
IONIC REACTIONS
Unusual five-coordinate complexes of transition metal ions
N77-12172
IONIZATION
Ionization processes relevant to the formation of new materials
[AD-A025197] N77-12130
IONIZED GASES
The behaviour of impurities in a steady-state DT gas-blanket reactor --- ion-ion and electron-ion collision contribution to Nernst effect
[REPT-75-90] N77-12877
IONIZING RADIATION
Aircraft ionizing doses and dose rates from radioactive clouds and fallout
[AD-A024896] N77-12053
Radiation exposure of the Italian population due to medical diagnostic examinations in 1974
[ISS-P-75/13] N77-12683
Nonpropulsive applications of ion beams
[NASA-TM-X-73511] N77-12847
A theoretical study of the permanent and transient effects of ionizing radiation on the electrical performance of metal oxide semiconductor on sapphire inverters
[AD-A024752] N77-12904
IONOGRAMS
Digital ionospheric sounding in support of arctic research
[AD-A024706] N77-12630
IONOSPHERIC ELECTRON DENSITY
Investigations on ionospheric electron content and electron density irregularities at low latitudes with geostationary satellites
[AD-A024957] N77-12628
IONOSPHERIC PROPAGATION
The maximum liklihood method applications to DAASM studies
[AD-A025223] N77-12258
World maps of sporadic E [foEs greater than 7 MHz] for use in prediction of VHF oblique-incidence propagation
[PB-255904/5] N77-12269

Low frequency wave-reflection properties of the equatorial ionosphere
[AD-A025111] N77-12623
Investigations on ionospheric electron content and electron density irregularities at low latitudes with geostationary satellites
[AD-A024957] N77-12628

IONOSPHERIC SOUNDING
Digital ionospheric sounding in support of arctic research
[AD-A024706] N77-12630

IONOSPHERICS
Use and analysis of the scientific data from the INTASAT satellite
[NASA-TT-F-16738] N77-12094

IONS
Ionization processes relevant to the formation of new materials
[AD-A025197] N77-12130
Photon interactions with atmospheric negative ions
[AD-A025770] N77-12163

IOWA
Improving water quality by control of algae: Cellular and extracellular blue-green algal polysaccharides
[PB-254614/1] N77-12563

IRON
Processing FeB03 glass-ceramics in space
[NASA-CR-150068] N77-12084
Effects of iron and silicon content on stress corrosion cracking in a thermomechanically processed aluminum alloy
[AD-A025165] N77-12210

IRON ALLOYS
Directionally solidified iron-base eutectic alloys
[NASA-TN-D-8354] N77-12185

IRON COMPOUNDS
Axial effects in planar complexes: Iron tetraphenylporphyrinrin and nickel bisdiphenylglyoxime halides N77-12890

IRON METEORITES
Schreibersite growth and its influence on the metallography of coarse structured iron meteorites N77-12958

ISOMERS
Ionization processes relevant to the formation of new materials
[AD-A025197] N77-12130

ISOTHERMAL PROCESSES
General purpose rocket furnace
[NASA-CASE-MFS-23460-1] N77-12070

ISOTOPE SEPARATION
Method for isotope separation
[NASA-TT-F-16743] N77-12841

ISOTOPIC LABELING
On the isotope effect in hydrogen embrittlement of niobium
[AD-A025180] N77-12211

ITALY
Remote sensing of geothermic activities of the volcanoes Aetna, Stromboli and Vesuv by means of infrared NOAA-VHRR-satellite data — Italy N77-12485
Radiation exposure of the Italian population due to medical diagnostic examinations in 1974
[ISS-P-75/13] N77-12683

J

JET AIRCRAFT
Vortex simulation of the pressure field of a jet
[NASA-TM-X-73984] N77-11989
Investigation of jet plume effects on the longitudinal stability characteristics of a body of revolution with various fin configurations at Mach numbers from 0.2 to 2.3 [normal jet plume simulator]
[AD-A024978] N77-12006

JET ENGINE FUELS
Synthesis and analysis of jet fuel from shale oil and coal syncrudes
[NASA-CR-135112] N77-12230

JET ENGINES
Alternatives for jet engine control
[NASA-CR-146531] N77-12058

JET FLAPS
Wind tunnel investigation of internally blown jet-flap STOL airplane model
[NASA-TN-D-8309] N77-11995

JET FLOW
On the simulation of an underexpanded propulsive jet for the investigation of the static longitudinal stability of an axially symmetric flight vehicle in supersonic flow
[ESA-TT-334] N77-12004
Flow visualization of the turbulent jet at the exit of a single element nozzle by holographic technique, and mean velocity profile measurements with a laser Doppler anemometer
[AD-A025439] N77-12348

JP-5 JET FUEL
Electrostatic properties of JP-5 jet fuel from alternate sources
[AD-A025684] N77-12232

JUPITER [PLANET]
Solar out-of-ecliptic study. Volume 1: Executive summary — Jupiter swingby scientific mission
[ESS/SS-699-VOL-1] N77-12087
Solar out-of-ecliptic study. Volume 2: System analysis and definition — Jupiter swingby scientific mission
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition — Jupiter swingby scientific mission
[ESS/SS-699-VOL-3] N77-12089
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091
Jupiter and Saturn. Giants of the solar system
[NASA-TT-F-17274] N77-12986
Charged-particle absorption by Io
[NASA-CR-149162] N77-12989

JUPITER PROBES
Orbiter description document for Jupiter Orbiter Probe 1981/1982 Mission
[NASA-CR-149244] N77-12097

K

KALMAN FILTERS
Triangular covariance factorizations for
[NASA-CR-149147] N77-12115

KANSAS
Pavement surface dynamics friction measurement and analysis in Kansas
[PB-255490/5] N77-12459

KARMAN VORTEX STREET
Flow-induced vibrations resulting from Karman vortex trails
[BLL-RISLEY-TR-2994-[9091.9F]] N77-11988

KEPLER LAWS
Kepler motion of interacting bodies; jet streams N77-12964

KERNEL FUNCTIONS
An optimal method for evaluating a class of convolution integrals with related kernels
[PB-251156/6] N77-12795

KINEMATICS
Roller bearing geometry design
[NASA-CR-135082] N77-12403

KINETIC ENERGY
Similar solutions of the differential equations for mean velocities, turbulence energy and turbulence length
[ESA-TT-354] N77-12339

KINETIC THEORY
Study of evaporation and condensation problems by kinetic theory, volume 41, no. 5
[ISAS-541] N77-12330
The kinetics of evolution of water vapor clusters in air
[AD-A025675] N77-12349
A survey of kinetic data of compounds containing flourine
[NASA-TM-X-73983] N77-12609

KUTTA-JOUKOWSKI CONDITION
User's manual: Supersonic unsteady cascade program, volume 2
[AD-A025186] N77-12012

L

LABORATORY EQUIPMENT
Microwave exposure facility: Multiple animal exposure at equal power density
[AD-A024939] N77-12667

LAKE ERIE
Chloride management in Lake Erie Basin
[PB-256241/1] N77-12584

LAKES
Improving water quality by control of algae: Cellular and extracellular blue-green algal polysaccharides
[PB-254614/1] N77-12563

LAMINAR FLOW
Through-flow calculations in axial turbomachinery: A technical point of view N77-12015
Deposition of suspensions in laminar flow
[AD-A025886] N77-12341
A program for the stability analysis of pipe Poiseuille flow
[AD-A024927] N77-12351

LAMINATES
Fracture of composite orthotropic plates containing periodic buffer strips N77-12131
Fatigue of notched fiber composite laminates. Part 2: Analytical and experimental evaluation
[NASA-CR-145039] N77-12133
Study of processing and properties of graphite fiber/high temperature resin composites
[AD-A024733] N77-12141
The welding of organic coated steels and laminates
[PB-256056/3] N77-12416

LAND USE
The Ohio land allocation model, phase 2
[E77-10042] N77-12472
Planning applications in east central Florida
[E77-10044] N77-12474
Development of a multi-disciplinary ERTS user program in the state of Ohio
[E77-10045] N77-12475
LUMIS: Land Use Management and Information Systems; coordinate oriented program documentation
[NASA-CR-149165] N77-12483

LANDING GEAR
Boron-epoxy-reinforced titanium aircraft landing-gear drag strut
[NASA-TN-D-8289] N77-12218

LANDSAT SATELLITES
LANDSAT 1 US cumulative catalog, 1975 - 1976
[NASA-TM-X-74298] N77-12468
LANDSAT 1 non-US cumulative catalog, 1975 - 1976
[NASA-TM-X-74297] N77-12469
An application of ERTS technology to the evaluation of coal strip mining and reclamation in the northern Great Plains
[NASA-CR-149208] N77-12486
LANDSAT US standard catalog — LANDSAT imagery for July 1976
[NASA-TM-X-74261] N77-12490
LANDSAT US standard catalog
[GSFC/LU-76/008] N77-12491
LANDSAT non-US standard catalog — LANDSAT imagery for July 1976
[NASA-TM-X-74259] N77-12492
LANDSAT non-US standard catalog — LANDSAT imagery for August 1976
[NASA-TM-X-74258] N77-12493

LANDSAT 1
Effect of sun angle, atmospheric attenuation, and turbulence on mirror beacons for LANDSAT image control
[PB-255404/6] N77-12488

LANTHANUM
Resonance lines and energy levels of Cs3, Ba4, and La5
[NASA-CR-149207] N77-12844

LANTHANUM COMPOUNDS
Kondo and magnetic ordering behavior in singlet ground state systems N77-12891

LARGE SCALE INTEGRATION
Control for large scale and uncertain systems
[AD-A025819] N77-12779

LASER APPLICATIONS
Development and application of an interferometric system for measuring crack displacements
[NASA-CR-145106] N77-12367
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388
Tracker backscatter study
[AD-A025768] N77-12391
Coherent Optical Adaptive Techniques [COAT]
[AD-A025669] N77-12395

LASER DOPPLER VELOCIMETERS
Velocity measurements on the aerodynamic wake of a hovercraft using laser Doppler anemometry
[UTIAS-TN-203] N77-12010

LASER MATERIALS
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387
Coating science and technology — laser optical films
[AD-A025487] N77-12411
Reflective coatings reliability study
[AD-A025757] N77-12863

LASER OUTPUTS
Application of coherent anti-Stokes Raman scattering to measurements of gas concentrations in aerodynamic flows
[ESA-TT-331] N77-12160
An investigation of the degradation of a laser beam by high intensity turbulence
[AD-A025658] N77-12398
Laser radiation forces in magnetized plasmas
[AD-A025003] N77-12881

LASER RANGER/TRACKER
Parametric analysis of laser target designators for airborne applications
[AD-A025659] N77-12397

LASER WINDOWS
Coating science and technology — laser optical films
[AD-A025487] N77-12411

LASERS
Studies into tunable-laser-excited atomic fluorescence spectrometry N77-12381
Laser interferometer techniques for inspection of optical components
[AD-A025088] N77-12385
Propagation of multiwavelength laser radiation through atmospheric turbulence
[AD-A024863] N77-12389

Investigation of electron impact processes relevant to visible lasers
[AD-A025005] N77-12399
Metal vapor visible laser kinetics program
[AD-A025004] N77-12400
Laser diagnostics of laser-produced plasmas
[AD-A024936] N77-12880
LATERAL CONTROL
Generalization and refinement of an automatic landing system capable of curved trajectories
[NASA-TN-D-8336] N77-12032
LATERITES
Characterization study of domestic nickeliferous laterites by electron optical and X-ray techniques
[PB-256699/0] N77-12499
LATTICE PARAMETERS
Electrostatic calculations in membrane systems
N77-12146
LAW [JURISPRUDENCE]
Laws and regulations affecting coal with summaries of Federal, State, and local laws and regulations pertaining to air and water pollution control, reclamation, diligence and health and safety, part 1
[PB-255927/6] N77-12592
LEAST SQUARES METHOD
Finite least squares collocation method
N77-12782
The covariance matrix for the solution vector of an equality-constrained least-squares problem
[NASA-CR-149232] N77-12788
LENSES
USAF aviator classes. HGU-4/P: History and present state of development
N77-12712
Lens material evaluation [goggles, sun, wind, and dust]
[AD-A025778] N77-12860
LEPTONS
Phenomenology of lepton production
[PM/76/5] N77-12848
LIAPUNOV FUNCTIONS
Stability analysis of extended gyrostats
N77-12829
LIFE [DURABILITY]
Applicability of spectrometric oil analysis to internal combustion engines: Initial phase of extended life test
[AD-A024743] N77-12168
LIFE SUPPORT SYSTEMS
F. A. Tsander and modern cosmonautics
[NASA-TT-F-17096] N77-12080
LIFT
Display and calculation of flow past wings in supersonic flight
[ESA-TT-333] N77-12003
LIFT FANS
Cold-air performance of a tip turbine designed to drive a lift fan. 1: Baseline performance
[NASA-TM-X-3452] N77-12000
LIGHT BEAMS
Two-photon correlations in a widely divergent light beam
N77-12854
LIGHT EMISSION
Intense pulse phenomena
[AD-A025483] N77-12845
LIGHT EMITTING DIODES
Optoelectronic devices packaged for fiber optics application, volume 1
[AD-A025905] N77-12861
LIGHT SCATTERING
Elastic and quasi-elastic laser light scattering of photochromic macromolecules
N77-12383
Low efficiency diffraction grating theory
[AD-A024804] N77-12866
LIGHT TRANSMISSION
Coherent Optical Adaptive Techniques [COAT]
[AD-A025669] N77-12395
LIGHT WATER BREEDER REACTORS
Fracture toughness of pressure vessel materials for light water reactors
[AD-A025808] N77-12461
LIGHTING EQUIPMENT
The Basis for Effective Management of Lighting Energy
[PB-256070/4] N77-12544
LIGHTNING
Measurement of optical power radiated by Florida lightning
[AD-A025320] N77-12621
Lightning strike warnings for tethered balloon operations
[AD-A025486] N77-12649
Health implications of the risks connected with the use of americium 241 for lightning protection -- metabolism and pathological effects, and radioprotection
[ISS-R-75/16] N77-12684
LIMITER CIRCUITS
Feasibility study of the use of current limiting devices in interruption and sectionalizing of DC circuits in mines
[PB-256541/4] N77-12322
LIMITS [MATHEMATICS]
Limiting mechanisms in MHD generator performance
[AD-A025949] N77-12879
LINE SPECTRA
Resonance lines and energy levels of Cs3, Ba4, and La5
[NASA-CR-149207] N77-12844
LINEAR ARRAYS
Spectral effects on cross-sectional reconstruction from X-rays
N77-12855
LINEAR INTEGRATED CIRCUITS
Microcircuit device reliability linear/interface microcircuit data
[AD-A019433] N77-12300
A survey of computer-aided electronic circuit design programs
[AD-A024768] N77-12309
LINEAR PROGRAMMING
A subgradient procedure for the solution of minimax location problems
[AD-A025288] N77-12796
Representations of unbounded optimizations as integer programs
[AD-A025603] N77-12798
Set partitioning: A survey
[AD-A025600] N77-12828
LINEAR SYSTEMS
Results of some investigations of differential gain theory applied to air-to-air systems. Volume 2: Stochastic differential games with complexity constrained strategies for air-to-air systems
[AD-A025322] N77-12008
Linear noise-cancelling microphone
[AD-A025903] N77-12263
Reduced order models for power system analysis
N77-12291
LINEARITY
Induced representations and positive linear maps of ordinary C-algebras
N77-12787
LIQUEFIED NATURAL GAS
Ship steel weldments for low temperature service
[PB-256997/8] N77-12203
LIQUID CHROMATOGRAPHY
Preparative high performance liquid chromatography
N77-12156
LIQUID COOLING
Fluid cooling of high power density semiconductor devices
[AD-A025815] N77-12314
Effectiveness of four water cooled undergarments and a water cooled cap in reducing heat stress
[AD-A025216] N77-12696
LIQUID LASERS
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387
LIQUID PHASES
Experimental and theoretical investigation of the thermodynamic properties of sulfur hexafluoride in the liquid phase
[AD-A024986] N77-12919
LIQUID PROPELLANT ROCKET ENGINES
Analysis of liquid-propellant rocket engines designed by F. A. Tsander
[NASA-TT-F-16748] N77-12122
Rocket engine assemblies and gas generator plenum
[AD-A025932] N77-12125
Development of hydrazine gas generator/plenum system
[AD-A025931] N77-12126
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158
LITERATURE
Literature review: Impact toughness of bainite versus martensite
[AD-A025858] N77-12189
LITHIUM
Measured performance of a 3 ton LiBr absorption water chiller and its effect on cooling system operation
[NASA-TM-X-73496] N77-12518
The clustering of O2 and He to Li[+]
[AD-A025762] N77-12625
Variational calculations with hyperspherical basis sets on atomic helium and lithium
N77-12839
LITHIUM COMPOUNDS
Charge transport and the photorefractive effect in doped and undoped lithium tantalate
N77-12358
Lithium iodate parametric oscillator
[AD-A025758] N77-12392
Thermal energy storage material thermophysical property measurement and heat transfer impact
[NASA-CR-135098] N77-12510
Molecular orbital studies of electron deficient compounds
N77-12837
LITHIUM NIOBATES
The role of charge transport in the formation and erasure of volume phase holograms in electrooptic lithium niobate
N77-12359
LOADS [FORCES]
Hydraulic press: RDL Redcar
[PB-256050/6] N77-12414
A tensile testing experiment correlating load with acoustic emission
[AD-A024813] N77-12450
An empirical design procedure for shafts with fatigue loadings
[AD-A024785] N77-12457
LOGISTICS MANAGEMENT
On-orbit and in-plant satellite storage
[AD-A025902] N77-12105
LONGITUDINAL STABILITY
On the simulation of an underexpanded propulsive jet for the investigation of the static longitudinal stability of an axially symmetric flight vehicle in supersonic flow
[ESA-TT-334] N77-12004
Investigation of jet plume effects on the longitudinal stability characteristics of a body of revolution with various fin configurations at Mach numbers from 0.2 to 2.3 [normal jet plume simulator]
[AD-A024978] N77-12006
LORAN C
Development of a Distress Alerting and Locating System [DALS]
[AD-A023841] N77-12034
LOW COST
Low-cost data analysis systems for processing multispectral scanner data
[NASA-TR-R-467] N77-12767
LOW GRAVITY MANUFACTURING
Low-gravity processing of superconducting compounds
[NASA-CR-150106] N77-12183
LOW PASS FILTERS
Follow-up filter
[CEPHAG-23/75] N77-12299
LOW PRESSURE
Heat transfer and carryover of low pressure water in a heated vertical tube
[PB-256480/5] N77-12346
A search for chemical laser action in low pressure metal vapor flames
N77-12380
LOW SPEED WIND TUNNELS
Digital computer aspects of the instrumentation and control of the new RAE 5 metre low speed tunnel
N77-11970
Low-speed wind-tunnel investigation of a large scale advanced arrow-wing supersonic transport configuration with engines mounted above wing for upper-surface blowing
[NASA-TN-D-8350] N77-11997
LUBRICATING OILS
Applicability of spectrometric oil analysis to internal combustion engines: Initial phase of extended life test
[AD-A024743] N77-12168
LUBRICATION
High-survivable transmission system
[AD-A025930] N77-12046
LUMINESCENCE
Luminescence properties of cyclic polynitramines
N77-12850
LUNAR EVOLUTION
Origin and evolution of the Earth-Moon system
N77-12982

M

M STARS
Spectrophotometry of cool stars in the near infrared. Part 3: Results for a region in the direction of l 2 = 138 deg
[ISBN-0-902553-13-5] N77-12957
MACH NUMBER
Investigation of very low blockage ratio boattail models in the Langley 16-foot transonic tunnel
[NASA-TN-D-8335] N77-11998
MACHINE TRANSLATION
PDP-11 macro cross assembler
[AD-A025751] N77-12731
MACHINERY
Calculation of cost in design of machinery
[JPRS-68285] N77-12422
MAGNESIUM ALLOYS
High strength-high damping capacity wrought magnesium alloys
[AD-A025164] N77-12212
MAGNESIUM FLUORIDES
Investigation of the absorption coefficients of Ge and MgF2 in the ultraviolet, visible, and near-infrared spectrum ranges in the 300 - 800 K band
N77-12856

MAGNETIC ANOMALIES
Bounding the thickness of the oceanic magnetized layer N77-12661

MAGNETIC CONTROL
Automatic magnetic control of a momentum-biased observatory in equatorial orbit N77-12098
Passive attitude stabilization of satellites — magnetic and gravity gradient methods [VTH-176] N77-12100

MAGNETIC DISKS
Disk drive interface characteristics [PB-256440/9] N77-12737

MAGNETIC DISTURBANCES
A region of intense plasma wave turbulence on auroral field lines [NASA-CR-149209] N77-12620

MAGNETIC DOMAINS
Time domain radiation fields of a monopole antenna [AD-A025619] N77-12252

MAGNETIC FIELDS
Methods of diminishing the influence of perturbing fields on magnetometric sensors N77-12362
Properties of electron gas in constant magnetic and electric fields [AD-A025464] N77-12905

MAGNETIC FILMS
Surface effects on spinwave resonance in thin magnetic films N77-12884

MAGNETIC LENSES
An 82 to 84 percent efficient, small size, 2 and 4 stage depressed collector for octave bandwidth high performance TWT's [NASA-TM-X-73572] N77-12297

MAGNETIC MATERIALS
Surface effects on spinwave resonance in thin magnetic films N77-12884

MAGNETIC MEASUREMENT
Bounding the thickness of the oceanic magnetized layer N77-12661

MAGNETIC PROPERTIES
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper (I) oxime imines of 2, 3-butanedione N77-12889
Kondo and magnetic ordering behavior in singlet ground state systems N77-12891

MAGNETIC RESONANCE
Magnetic resonance studies of paramagnetic transition metal complexes N77-12171

MAGNETIC STORMS
An overview of magnetospheric dynamics [MPAE-W-100-76-01] N77-12613
Satellite beacon data reduction and analysis [AD-A025329] N77-12617

MAGNETOHYDRODYNAMIC FLOW
An overview of magnetospheric dynamics [MPAE-W-100-76-01] N77-12613
MHD oscillatory flow past a semi-infinite flat plate N77-12876

MAGNETOHYDRODYNAMIC GENERATORS
Costs of alternative sources of electricity [PB-255765/0] N77-12528
Limiting mechanisms in MHD generator performance [AD-A025949] N77-12879

MAGNETOHYDRODYNAMICS
Pulsed thermionic converter study [NASA-CR-149234] N77-12123
Laser radiation forces in magnetized plasmas [AD-A025003] N77-12881

MAGNETOMETERS
Methods of diminishing the influence of perturbing fields on magnetometric sensors N77-12362

MAGNETOSPHERE
An overview of magnetospheric dynamics [MPAE-W-100-76-01] N77-12613
Magnetosphere dynamics by localization of ultra low frequency waves [CEPHAG-3/76] N77-12614
Solar and magnetospheric science [NASA-TM-X-3440] N77-12990

MAGNONS
Surface effects on spinwave resonance in thin magnetic films N77-12884

MAN ENVIRONMENT INTERACTIONS
Priorities in air pollution source control: Modeling of population exposures and health effects N77-12558

MAN MACHINE SYSTEMS
Feasibility of implementing specific performance measurement techniques [AD-A025945] N77-12705

MANAGEMENT INFORMATION SYSTEMS
Research and Development Management Analysis System [RDMAS] [AD-A025447] N77-12920

MANAGEMENT METHODS
A methodology for the evaluation of program cost and schedule risk for the SEASAT program [NASA-CR-149230] N77-12478

MANAGEMENT PLANNING
Research and technology objectives and plans. A summary, FY 1977 research and technology program [NASA-TM-X-74296] N77-12925

MANDELSTAM REPRESENTATION
Two particle unitary for helicity amplitudes with particles of arbitrary spin N77-12843

MANGANESE
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy N77-12178

MANIPULATORS
Task descriptors for automated assembly [PB-255545/6] N77-12410

MANNED SPACE FLIGHT
Entrance of mankind into space [15th anniversary of the first manned flight into space] [NASA-TT-F-17114] N77-12082

MANUALS
Evaluation of water quality models: A management guide for planners [PB-256412/8] N77-12574
An initial study of current and projected publishing technology pertinent to the Navy Technical Manual System [NTMS] [AD-A025744] N77-12926

MANUFACTURING
Study of processing and properties of graphite fiber/high temperature resin composites [AD-A024733] N77-12141
Influence of subsurface defects on fatigue properties of titanium alloys [AD-A025892] N77-12193
Manufacturing methods and techniques for piezoelectric transformers [AD-A025176] N77-12323

MAP MATCHING GUIDANCE
Investigation of the use of an electronic multifunction display and an electromechanical horizontal situation indicator for guidance and control of powered-lift short-haul aircraft [NASA-CR-137922] N77-12055

MARINE BIOLOGY
Conference proceedings, Energy from the Oceans, Fact or Fantasy [PB-256093/6] N77-12547
Physical-chemical methods for the control of algal species and composition in algal culturing facilities [PB-256784/0] N77-12600

MARINE ENVIRONMENTS
Environmental effects on the strength of a glass fiber-reinforced-plastic rod material [PB-256296/5] N77-12224
Dissolved oxygen meter, model 57 [Yellow Springs Instrument Co., Inc., Ohio] [PB-256754/3] N77-12378
Conference proceedings, Energy from the Oceans, Fact or Fantasy [PB-256093/6] N77-12547
Sunlight and the ocean [AD-A024678] N77-12665
Comparison of computer simulation models with field data from nearshore environments [AD-A025682] N77-12734
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures [PB-255222/2] N77-12943

MARINE METEOROLOGY
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 6, 1966 [KNMI-151-6] N77-12643
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 7, 1967 [KNMI-151-7] N77-12644
Mariners weather log, volume 20, number 3, May 1976 [PB-250014-03] N77-12659

MARINE RESOURCES
Conference proceedings, Energy from the Oceans, Fact or Fantasy [PB-256093/6] N77-12547

MARINE TRANSPORTATION
Towed planning sled for delivery of oil pollution control equipment [AD-A025247] N77-12569

MARKET RESEARCH
Economics of depletable resources: Market forces and intertemporal bias [PB-255623/1] N77-12930

MARKETING
Petroleum market shares. Report on sales of propane to ultimate consumers, 1975 [PB-255624/9] N77-12540

MARKOV CHAINS
The diastereosequence distribution resulting from a two-state mechanism involving first order Markovian addition steps N77-12129
Modeling reliability and maintainability characteristics of production systems via the Markov process [AD-A025121] N77-12426
Using strong convergence to accelerate value iteration [AD-A025604] N77-12746

MARS [PLANET]
On the habitability of Mars: An approach to planetary ecosynthesis [NASA-SP-414] N77-12718

MARTENSITE
Literature review: Impact toughness of bainite versus martensite [AD-A025858] N77-12189

MASKING
Mask pattern generation techniques [AD-A025343] N77-12727

MASS DISTRIBUTION
On finding K nearest neighbors in the plane [AD-A025610] N77-12747
Mass distribution and the critical velocity N77-12979
The structure of the groups of secondary bodies N77-12981

MASS SPECTROSCOPY
Thermochemistry of gaseous metal oxides [AD-A025661] N77-12164

MATERIALS TESTS
Preliminary evaluation of ATQ polymer as a potential matrix resin [AD-A025897] N77-12222

MATHEMATICAL MODELS
Experimental and theoretical analysis of transonic flow around a sphere N77-11987
The effect of various air density-altitude relations on the phugoid [NASA-TT-F-17118] N77-11990
Models for calculating flow in axial turbomachinery N77-12014
Analysis of pressure distortion testing [NASA-CR-2766] N77-12041
A mathematical model for the starting process [AD-A025692] N77-12076
A study of the drag characteristics and polymer diffusion in the boundary layer of an axisymmetric body [AD-A024667] N77-12227
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation N77-12430
Priorities in air pollution source control: Modeling of population exposures and health effects N77-12558
Evaluation of water quality models: A management guide for planners [PB-256412/8] N77-12574
Software modeling studies [AD-A025895] N77-12749
Phenomenology of lepton production [PM/76/5] N77-12848
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs [PB-256564/6] N77-12939

MATHEMATICAL TABLES
Notes on the computation of the generalized zeta and digamma functions with programs and tables [AD-A025134] N77-12707

MATRICES [MATHEMATICS]
Through-flow calculations in axial turbomachinery: A technical point of view N77-12015
Improving the reliability of factor analysis of chemical data by utilizing the measured analytical uncertainty [AD-A025951] N77-12169
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 1: Multiconductor transmission line theory [AD-A025028] N77-12304
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 2: Computation of the capacitance matrixes for ribbon cables [AD-A025029] N77-12305
Computer programs for multidimensional spectra array processing [PB-256098/5] N77-12759
The exchange partition functions of the rigid asymmetric top N77-12784
The covariance matrix for the solution vector of an equality-constrained least-squares problem [NASA-CR-149232] N77-12788
A solving algorithm for systems of nonlinear algebraic equations [AD-A025766] N77-12806

Classification techniques appropriate for unequal covariance matrices N77-12815
Stochastic approximation with correlated data [AD-A024279] N77-12819
MATRIX METHODS
SPARCOM: A sparse matrix associative relational approach to dynamic data structuring and data retrieval N77-12921
MAXIMUM LIKELIHOOD ESTIMATES
The maximum liklihood method applications to DAASM studies [AD-A025223] N77-12258
MEAN FREE PATH
Inverse mean free path, stopping power, CSDA range, and straggling in silicon and silicon dioxide for electrons of energy less than or equal to 10 keV [AD-A025488] N77-12902
MEASURE AND INTEGRATION
Invariant measures and its applications N77-12792
MEASURES
Information on the metric system and related fields [NASA-TM-X-3449] N77-12992
MEASURING INSTRUMENTS
Operational use of computers associated with the Modane wind tunnels N77-11971
Preliminary evaluation of fatigue life gages used for beam life prediction [AD-A024811] N77-12375
Diurnal measurements with prototype CMOS Omega receivers [NASA-CR-149160] N77-12606
MECHANICAL DEVICES
Automatic multiple-sample applicator and electrophoresis apparatus [NASA-CASE-ARC-10991-1] N77-12157
Thermal vacuum qualification tests on a Dornier medium speed despin mechanism [ESA-ESTL-20] N77-12409
MECHANICAL DRIVES
Mechanical thermal motor [NASA-CASE-MFS-23062-1] N77-12402
Increased fuel economy in transportation systems by use of energy management: Second year's program. Executive summary [PB-256117/3] N77-12536
MECHANICAL ENGINEERING
Optimal design of mechanical systems with intermittent motion [AD-A025010] N77-12421
MECHANICAL PROPERTIES
Literature review: Impact toughness of bainite versus martensite [AD-A025858] N77-12189
Improvement of reliability and the mechanical properties of titanium alloy forgings [AD-A025479] N77-12197
Fabrication and evaluation of hot isostatically pressed beryllium [AD-A024780] N77-12198
New approaches to titanium alloy microstructure-property characterization [AD-A025734] N77-12199
Variation of mechanical properties in large steel forgings [AD-A025807] N77-12208
Effects of the physiological environment on the long-term physical performance of polymeric materials [NASA-CR-149206] N77-12220
Preliminary evaluation of ATQ polymer as a potential matrix resin [AD-A025897] N77-12222
Development of highly oriented polymers with improved mechanical properties [AD-A024988] N77-12228
MEDICAL EQUIPMENT
Biomedical technical transfer. Applications of NASA science and technology [NASA-CR-149161] N77-12935
MEDICAL SCIENCE
USSR Academy of Medical Sciences [JPRS-68310] N77-12693
MEDITERRANEAN SEA
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 6, 1966 [KNMI-151-6] N77-12643
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 7, 1967 [KNMI-151-7] N77-12644
MELTING
Zonal energetics balances for the melting of carbon ferrochromium [NLL-M-25334-[5828.4F]] N77-12176
Effects of radiation penetration on snowmelt runoff hydrographs [AD-A025763] N77-12489
MEMBRANES
Electrostatic calculations in membrane systems N77-12146
MERCURY [METAL]
A method for the determination of total mercury in ambient air [PB-255698/3] N77-12590
MERCURY TELLURIDES
Study of the effects of radiation on the electrical and optical properties of HgCdTe [AD-A025222] N77-12257
MESSAGES
Interprocess communication protocols for computer networks [AD-A025508] N77-12254
The effect of auditory and visual presentation of navigational messages on message retention [PB-256599/2] N77-12706
METAL COMPOUNDS
Toxic heavy metals in groundwater of a portion of the front range mineral belt [PB-256212/2] N77-12582
METAL FATIGUE
Influence of subsurface defects on fatigue properties of titanium alloys [AD-A025892] N77-12193
METAL FILMS
Investigations of surfaces and interfaces using optical excitation of surface plasmons [AD-A025285] N77-12162
Evaporation and surface energy of a metal deposited in a discontinuous thin film N77-12179
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films N77-12289
METAL HYDRIDES
Process for manufacture of stable highly pure metals which form gaseous hydrides, such as silicon or germanium, by means of electrical discharges [NASA-TT-F-16763] N77-12180
METAL IONS
Ion binding studies of polysulfonates N77-12840
METAL MATRIX COMPOSITES
Advanced V/STOL propeller critical components investigation [AD-A024663] N77-12063
Further development and application of polycrystalline metal whiskers [BMFT-FB-T-76-18] N77-12219
METAL OXIDE SEMICONDUCTORS
An assembler for the MOS Technology 6502 microprocessor as implemented in jolt [TM] and KIM-1 [TM] [NASA-CR-149227] N77-12030
Reliability of deposited glass [AD-A024664] N77-12226
Advanced integrated-circuit technology for micropower ICs. Integrated circuits [AD-A025507] N77-12303
Survey of radiation effects in metal insulator semiconductor devices [AD-A024809] N77-12311
A theoretical study of the permanent and transient effects of ionizing radiation on the electrical performance of metal oxide semiconductor on sapphire inverters [AD-A024752] N77-12904
Reliability evaluation of C/MOS technology in complex integrated circuits [AD-A024918] N77-12911
METAL OXIDES
Thermochemistry of gaseous metal oxides [AD-A025661] N77-12164
METAL PLATES
On the dynamic stress concentration of notched plates as induced by tensile stress waves, volume 41, no. 4 [ISAS-540] N77-12434
METAL POWDER
The thermal conductivity of metal-power/epoxy-resin composites [AD-A024963] N77-12143
METAL SPINNING
Theoretical analysis of ATJS graphite disks fractured by spinning [AD-A024711] N77-12451
METAL VAPORS
A search for chemical laser action in low pressure metal vapor flames N77-12380
Metal vapor visible laser kinetics program [AD-A025004] N77-12400
METAL-NITRIDE-OXIDE-SILICON
Reliability evaluation MNOS arrays [AD-A025776] N77-12900
METALLURGY
Engineering efficiency of high unit-capacity metallurgical units [NLL-M-25379-[5828.4F]] N77-12175
Investigation of the stress corrosion cracking susceptibility of the alloy AlZnMgCu 1.5 with regard to electrochemical and metallurgical aspects [ESA-TT-336] N77-12186
METALS
The electron factor in catalysis on metals electrocatalysis on non-metallic surfaces [PB-256264/3] N77-12166
Modified GRAY: An improved three-phase equation of state for metals [AD-A025260] N77-12192
Metals mining and milling process profiles with environmental aspects [PB-256394/8] N77-12501
METEORITES
Meteorites and their precursor states N77-12980
METEOROIDS
A comparison of spacecraft penetration hazards due to meteoroids and manmade earth-orbiting objects [NASA-TM-X-73978] N77-12119
The small bodies N77-12962
Forces acting on small bodies N77-12963
Kepler motion of interacting bodies; jet streams N77-12964
Collisions: Fragmentation and accretion N77-12965
Relations between comets and meteoroids N77-12972
METEOROLOGICAL CHARTS
Automatic meteorological observations in Northern Greenland [P-62] N77-12642
METEOROLOGICAL PARAMETERS
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 6, 1966 [KNMI-151-6] N77-12643
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 7, 1967 [KNMI-151-7] N77-12644
Yearbook A, no. 126: Meteorology, 1974 [KNMI-97-126] N77-12645
Climatological data of Netherlands stations. Volume 9: Tables with data of aerodromes Amsterdam/Schiphol, Eindhoven/Eindhoven, Enschede/Twente, Groningen/Eelde, Maastricht/Zuid-Limburg and Rotterdam/Rotterdam according to observations in the period 1955 - 1970 [KNMI-150-9] N77-12646
Comparison of computer simulation models with field data from nearshore environments [AD-A025682] N77-12734
METEOROLOGY
Annals of meteorology no. 10: Development of meteorological observations in northern and central Germany up to 1700 [ISBN-3-88148-145-1] N77-12641
METHOD OF CHARACTERISTICS
Analysis of supersonic unsteady cascades with the method of characteristics, volume I [AD-A025909] N77-12342
METHYL COMPOUNDS
Determination of the torsional barriers around single bonds by vibrational spectroscopy N77-12153
Measurement of atmospheric sulfates: Literature search and methods selection [PB-254387/4] N77-12562
MEXICO
Contributions to paleomagnetism and rb-sr geochronology N77-12605
MICRODENSITOMETERS
OPTRIN and OPTAPE: Programs for interchange of data between REMAPP and the OPTRONICS P-1700 system [PB-256692/5] N77-12760
MICROELECTRONICS
Micro navigator [MICRON] phase 2A. Volume 2: Technical report [AD-A021526] N77-12033
Microcircuit device reliability linear/interface microcircuit data [AD-A019433] N77-12300
Solid state research, 1975: 4 [AD-A025489] N77-12901
MICROFILMS
Protection of information when using microfilm [NLL-M-24128-[5828.4F]] N77-12922
MICROPHONES
Linear noise-cancelling microphone [AD-A025903] N77-12263
MICROPROCESSORS
An assembler for the MOS Technology 6502 microprocessor as implemented in jolt [TM] and KIM-1 [TM] [NASA-CR-149227] N77-12030
Multiplexing techniques for advanced surface craft [X76-979/301] N77-12245
CHILD: A system for the development and didactic introduction to microprocessors [R-4-76] N77-12768
MICROPROGRAMMING
The design of totally self-checking systems [AD-A025608] N77-12725

On-line virtual architecture tuning using microcapture
N77-12741

MICROSTRIP TRANSMISSION LINES
A preliminary report on the in-house exploratory development program on microstrip patch antennas at the Naval Surface Weapons Center
[AD-A025304] N77-12256
Microstrips for UHF and microwaves: An evaluation of substrate materials and metallization technology for thin- and thickfilm microstrips
[ECN-19] N77-12295

MICROSTRUCTURE
Directionally solidified iron-base eutectic alloys
[NASA-TN-D-8354] N77-12185
New approaches to titanium alloy microstructure-property characterization
[AD-A025734] N77-12199

MICROWAVE CIRCUITS
Microstrips for UHF and microwaves: An evaluation of substrate materials and metallization technology for thin- and thickfilm microstrips
[ECN-19] N77-12295

MICROWAVE EQUIPMENT
Microwave exposure facility: Multiple animal exposure at equal power density
[AD-A024939] N77-12667

MICROWAVE RADIOMETERS
Laboratory calibration of AAFE radiometer/scatterometer [RADSCAT]
[NASA-TM-X-73900] N77-12363

MICROWAVE TRANSMISSION
Performance measurements over long line-of-sight microwave links in Colorado
[PB-256261/9] N77-12266
Space-to-earth power transmission system
[NASA-TM-X-73489] N77-12517

MICROWAVES
Microwave pulse sequence methods for the study of rotational relaxation processes
N77-12241

MIDLATITUDE ATMOSPHERE
Analysis of occurrence of sporadic E and accuracy of predictions of sporadic-E critical frequencies for Temperate Latitude Northern Hemisphere Stations
[PB-255875/7] N77-12268

MILITARY AIRCRAFT
A computer model for estimating development and procurement costs of aircraft DAPCA-III
[AD-A025276] N77-12929

MILITARY TECHNOLOGY
Development of the Military Construction Data System [MCDS], part 2
[AD-A024938] N77-12736
An initial study of current and projected publishing technology pertinent to the Navy Technical Manual System [NTMS]
[AD-A025744] N77-12926

MILITARY VEHICLES
A procedure for the statistical analysis of vehicular noise emission spectra for limited samples
[AD-A025981] N77-12602

MILLIMETER WAVES
Millimeter dual helix traveling-wave tube
[AD-A025104] N77-12308

MINERAL DEPOSITS
Proceedings of the Mineral Economics Symposium: Winning the high stakes at the critical commodity game
[PB-255607/4] N77-12502

MINERAL EXPLORATION
Metals mining and milling process profiles with environmental aspects
[PB-256394/8] N77-12501

MINES [EXCAVATIONS]
Feasibility study of the use of current limiting devices in interruption and sectionalizing of DC circuits in mines
[PB-256541/4] N77-12322
A passive personal sampler for nitrogen dioxide
[PB-254447/6] N77-12565

MINICOMPUTERS
Digital computer aspects of the instrumentation and control of the new RAE 5 metre low speed tunnel
N77-11970
On-line virtual architecture tuning using microcapture
N77-12741
A review of network access techniques with a case study: The network access machine
[PB-256525/7] N77-12773

MINIMAX TECHNIQUE
A subgradient procedure for the solution of minimax location problems
[AD-A025288] N77-12796

MINUTEMAN ICBM
Minuteman stage 3 component report
[AD-A025093] N77-12103

MISSILE COMPONENTS
Minuteman stage 3 component report
[AD-A025093] N77-12103

MISSILE CONTROL
Simulation models and baseline guidance and control for indirect-fire missiles with strapdown-inertial guidance
[AD-A024977] N77-12102

MISSILE SILOS
Ignition phase blast field of tube or silo launched rockets: Inviscid, chemically reacting flow model
[AD-A025198] N77-12106

MISSILE TRAJECTORIES
The generalized trajectory simulation system. Volume 4: Numerical operators
[AD-A025436] N77-12755

MISSION PLANNING
Solar out-of-ecliptic study. Volume 1: Executive summary --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-1] N77-12087
Solar out-of-ecliptic study. Volume 2: System analysis and definition --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-3] N77-12089
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091
SEATSAT programs option analysis
[NASA-CR-149229] N77-12477

MISSISSIPPI
An evaluation of public hearings on water development projects in Mississippi
[PB-256583/6] N77-12944

MISSOURI
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495

MIST
Method of computing the influence of spherically laminar inhomogeneities on tropospheric refraction and contribution to the radio refraction of mists, cloudiness and rain
N77-12242

MODELS
Another look at the concept of model
[UCRL-77896] N77-12790

MODEMS
A binary to gray code converter for incorporation in a data modem
[SRDE-76002] N77-12249

MODULATORS
Thermoplastic modulator brassboard
[AD-A025450] N77-12317

MODULUS OF ELASTICITY
Bounds for effective elastic moduli of disordered materials. Part 1: Formal theory
N77-12438

MOJAVE DESERT [CA]
Wind power prediction models
[NASA-CR-149235] N77-12509

MOLECULAR ENERGY LEVELS
Intense pulse phenomena
[AD-A025483] N77-12845

MOLECULAR EXCITATION
Electron impact excitation of molecular nitrogen: High energy-resolution studies of electron impact optical excitation functions of the first positive system
N77-12885

MOLECULAR GASES
High resolution 7 - 16 micron infrared spectrometry --- gas molecular spectroscopy, exemplified for methane and carbon dioxide
[ESA-TT-328] N77-12159

MOLECULAR INTERACTIONS
Quantum mechanical analysis of intramolecular interactions
N77-12838

MOLECULAR ORBITALS
Molecular orbital studies of electron deficient compounds
N77-12837

MOLECULAR RELAXATION
Emission spectroscopical investigation of the system F2-H2 in a shock tube
[ESA-TT-349] N77-12161
Microwave pulse sequence methods for the study of rotational relaxation processes
N77-12241

MOLECULAR SPECTROSCOPY
High resolution 7 - 16 micron infrared spectrometry --- gas molecular spectroscopy, exemplified for methane and carbon dioxide
[ESA-TT-328] N77-12159

MOLECULAR STRUCTURE
The diastereosequence distribution resulting from a two-state mechanism involving first order Markovian addition steps
N77-12129
Unusual five-coordinate complexes of transition metal ions
N77-12172
Molecular orbital studies of electron deficient compounds
N77-12837

MOLECULES
Elastic and quasi-elastic laser light scattering of photochromic macromolecules
N77-12383
A program of study on the aggregation of molecules and their effect on sound propagation
[AD-A025767] N77-12835

MOLYBDENUM
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289

MOLYBDENUM ALLOYS
Formation of an impeded recrystallization zone during the annealing of low-alloy molybdenum alloys
[NLL-M-25349-[5828.4F]] N77-12174

MOMENTUM TRANSFER
Transfer of angular momentum and condensation of grains
N77-12975

MONITORS
Terrestrial radiodetermination potential users and their requirements
[PB-255839/3] N77-12035
Directory of air quality monitoring sites active in 1974
[PB-256708/9] N77-12578

MONOCHROMATORS
Analytical applications of a high resolution echelle monochromator
N77-12151

MONOPOLE ANTENNAS
Numerical investigations of monopole antenna systems on conducting cylinders --- satellite antennas
[R-166] N77-12250
Time domain radiation fields of a monopole antenna
[AD-A025619] N77-12252

MONOPROPELLANTS
Rocket engine assemblies and gas generator plenum
[AD-A025932] N77-12125

MONTANA
Evaluation of SO2 emission control technology applicable to the East Helena lead smelter
[PB-255277/6] N77-12580

MONTE CARLO METHOD
The development and Monte Carlo investigation of non-hierarchical clustering procedure, and its application to discrimination problems in industrial administration
N77-12812

MOON
Equations of state and impact-induced shock-wave attenuation on the moon
[NASA-CR-149245] N77-12987

MOSSBAUER EFFECT
A Moessbauer study of Sn[2+]-doped europium monochalcogenides and a new look at the experimental foundations of spin-wave theory
N77-12888

MOTION SICKNESS
Automated electroencephalography system and electroencephalographic correlates of space motion sickness, part 2 --- sleep characteristics
[NASA-CR-151106] N77-12680
Motion sickness incidence: Exploratory studies of habituation, pitch and roll, and the refinement of a mathematical model
[AD-A024709] N77-12689
Development of a prototype experimental plan to evaluate stabilized optical viewing devices. 2: Inflight measures of airsickness potential
[AD-A025455] N77-12704

MOTORS
Mechanical thermal motor
[NASA-CASE-MFS-23062-1] N77-12402

MOVING TARGET INDICATORS
Performance of a range-ambiguous MTI and Doppler filter system
[AD-A025683] N77-12278

MULTILAYER INSULATION
Purging of a multilayer insulation with dacron tuft spacer by gas diffusion
[NASA-TM-X-3456] N77-12099

MULTIPHASE FLOW
Measurements of the rheological properties of multipath polymeric systems
N77-12216

MULTIPLEXING
Multiplexing techniques for advanced surface craft
[X76-979/301] N77-12245
Shipboard Data Multiplex System [SDMS]. A new design for lower ship cost and improved flexibility
[X75-1095/301] N77-12246

MULTIPROCESSING [COMPUTERS]
Optimal scheduling of tasks on multiprocessor systems
N77-12719

MULTIPROGRAMMING
Implementation of interactive graphics display in a multiprogramming environment
[AD-A025681] N77-12733

MULTISPECTRAL BAND SCANNERS
Digital processing and analysis of active multispectral data
[AD-A025009] N77-12401

MULTISPECTRAL PHOTOGRAPHY
Low-cost data analysis systems for processing multispectral scanner data
[NASA-TR-R-467] N77-12767
MULTIVARIATE STATISTICAL ANALYSIS
Spectral analysis of a univariate process with bad data points, via maximum entropy and linear predictive techniques
[AD-A024942] N77-12756
Classification techniques appropriate for unequal covariance matrices
N77-12815
Exact and approximate Bayesian solutions for inference about variance components and multivariate inadmissibility
[AD-A025452] N77-12824
MUSCULOSKELETAL SYSTEM
A model for analytic investigation of three-dimensional head-spine dynamics
[AD-A025911] N77-12686

N

N-TYPE SEMICONDUCTORS
Effectiveness of heat-emitting coatings with variable degree of blackness
N77-12893
NASA PROGRAMS
Research and technology objectives and plans. A summary, FY 1977 research and technology program
[NASA-TM-X-74296] N77-12925
NASTRAN
Boron-epoxy-reinforced titanium aircraft landing-gear drag strut
[NASA-TN-D-8289] N77-12218
NATURAL SATELLITES
The present structure of the planetary and satellite systems
N77-12960
The motion of planets and satellites
N77-12961
On the accretion of planets and satellites
N77-12970
NAVIGATION
Narrow-band passive systems theory with applications to positioning and navigation
[AD-A025743] N77-12036
NAVIGATION AIDS
Mariners weather log, volume 20, number 3, May 1976
[PB-250014-03] N77-12659
The effect of auditory and visual presentation of navigational messages on message retention
[PB-256599/2] N77-12706
NAVIGATION INSTRUMENTS
Micro navigator [MICRON] phase 2A. Volume 2: Technical report
[AD-A021526] N77-12033
NAVIGATION SATELLITES
Environmental position errors of the GPS. Army user equipment
[AD-A025940] N77-12101
NAVY
Shipboard Data Multiplex System [SDMS]. A new design for lower ship cost and improved flexibility
[X75-1095/301] N77-12246
The horizontally polarized dipole antenna as a solution to the problems of high frequency short range communications
[AD-A025674] N77-12277
An initial study of current and projected publishing technology pertinent to the Navy Technical Manual System [NTMS]
[AD-A025744] N77-12926
NEAR FIELDS
A study of near-field data handling and probe design techniques
[AD-A024990] N77-12283
NECK [ANATOMY]
A prediction of response of the head and neck of US adult military population to dynamic impact acceleration from selected dynamic test subjects
[AD-A025785] N77-12702
NEODYMIUM LASERS
Development and fabrication of a space hardened Nd[+3] YAG laser transmitter system for orbital range and altitude control
[AD-A025155] N77-12107
NERNST-ETTINGSHAUSEN EFFECT
The behaviour of impurities in a steady-state DT gas-blanket reactor --- ion-ion and electron-ion collision contribution to Nernst effect
[REPT-75-90] N77-12877
NETHERLANDS
Yearbook A, no. 126: Meteorology, 1974
[KNMI-97-126] N77-12645
Climatological data of Netherlands stations. Volume 9: Tables with data of aerodromes Amsterdam/Schiphol, Eindhoven/Eindhoven, Enschede/Twente, Groningen/Eelde, Maastricht/Zuid-Limburg and Rotterdam/Rotterdam according to observations in the period 1955 - 1970
[KNMI-150-9] N77-12646
NETWORK ANALYSIS
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 1: Multiconductor transmission line theory
[AD-A025028] N77-12304
Distance constraints for tree network multifacility location problems
[AD-A025287] N77-12770
Distributed computation study
[AD-A024670] N77-12774
NETWORK SYNTHESIS
ARPA internetwork protocols project
[AD-A024819] N77-12261
How to switch a beam-forming network with minimum disturbance to existing communication channels
[AD-A025208] N77-12302
NETWORKS
ARPA internetwork protocols project
[AD-A024823] N77-12260
TCP resynchronization
[AD-A024822] N77-12262
Computer network research
[AD-A025914] N77-12771
Data bus network simulation
[AD-A025115] N77-12772
A review of network access techniques with a case study: The network access machine
[PB-256525/7] N77-12773
NEURONS
The response to sound of identified reticulo-spinal cells
N77-12677
NEUROPHYSIOLOGY
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 --- reflex movements of the eye
[DRB-DR-225] N77-12671
Neurophysiology and road safety: Contribution of the frontal lobes to visual orienting
N77-12672
NEUTRON COUNTERS
Analysis of Skylab follow-on orbital neutron environmental data
[NASA-CR-150109] N77-12368
NEUTRON FLUX DENSITY
Analysis of Skylab follow-on orbital neutron environmental data
[NASA-CR-150109] N77-12368
NEW JERSEY
Water resources data for New Jersey, water year, 1975
[PB-256802/0] N77-12496
NEW YORK
Chloride management in Lake Erie Basin
[PB-256241/1] N77-12584
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures
[PB-255222/2] N77-12943
NICKEL
Hot corrosion and oxidation studies of pure nickel and Ni-Cr, Ni-Si and Ni-Cr-Si alloys at 1000 C
[AD-A024708] N77-12201
Characterization study of domestic nickeliferous laterites by electron optical and X-ray techniques
[PB-256699/0] N77-12499
NICKEL ALLOYS
Specific heat of dilute transition alloys
[ESA-TT-353] N77-12187
Hot corrosion and oxidation studies of pure nickel and Ni-Cr, Ni-Si and Ni-Cr-Si alloys at 1000 C
[AD-A024708] N77-12201
NICKEL CADMIUM BATTERIES
Energy storage systems: Behavior of SD 15K hermetically sealed NiCd cells; development trends
[NASA-TT-F-16761] N77-12508
Method and apparatus for reconditioning nickel-cadmium batteries
[NASA-CASE-MFS-23270-1] N77-12511
NICKEL COATINGS
Development of sputtered high temperature coatings for thrust chambers
[NASA-CR-135097] N77-12181
NICKEL COMPOUNDS
Axial effects in planar complexes: Iron tetraphenylporphyrinato and nickel bisdiphenylglyoxime halides
N77-12890
NIGHT VISION
Vision with the AN/PVS-5 night vision goggle
N77-12715
NIOBIUM
On the isotope effect in hydrogen embrittlement of niobium
[AD-A025180] N77-12211
NIOBIUM ALLOYS
NS-4 coating process development for columbium alloy airfoils
[AD-A025797] N77-12139
NITROGEN ATOMS
Electron impact excitation of molecular nitrogen: High energy-resolution studies of electron impact optical excitation functions of the first positive system
N77-12885
NITROGEN DIOXIDE
A passive personal sampler for nitrogen dioxide
[PB-254447/6] N77-12565
NITROGEN OXIDES
Photochemical air pollution: Weekday-weekend differences
N77-12557
Mechanism of photochemically initiated oxidations
[PB-256397/1] N77-12575
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
NOAA SATELLITES
Remote sensing of variations of sea-ice-surfaces in the Barents-Sea from 1966 - 1975 by means of satellite data, among others NOAA-VHRR
N77-12484
Remote sensing of geothermic activities of the volcanoes Aetna, Stromboli and Vesuv by means of infrared NOAA-VHRR-satellite data --- Italy
N77-12485
NOBLE METALS
Investigation of vacuum deposition processes by optical emission spectroscopy
N77-12851
NOISE [SOUND]
Effects of sound on the vestibular system
[AD-A025969] N77-12690
NOISE POLLUTION
A procedure for the statistical analysis of vehicular noise emission spectra for limited samples
[AD-A025981] N77-12602
NOISE REDUCTION
Analytical study of lightweight acoustic shrouds for shuttle experiments and payloads
[NASA-CR-150116] N77-12113
Linear noise-cancelling microphone
[AD-A025903] N77-12263
NOISE SPECTRA
A procedure for the statistical analysis of vehicular noise emission spectra for limited samples
[AD-A025981] N77-12602
NONDESTRUCTIVE TESTS
Holographic interferometer background fringe reduction by dual vacuum application
[AD-A024741] N77-12379
Symposium on nondestructive test and evaluation of airport pavements
[AD-A025442] N77-12444
NONLINEAR EQUATIONS
Nonlinear spline method for optimal thrust vector control atmospheric interceptor guidance
N77-12789
Periodic solutions of nonlinear hyperbolic partial differential equations
N77-12793
A solving algorithm for systems of nonlinear algebraic equations
[AD-A025766] N77-12806
NONLINEAR PROGRAMMING
Modification of the penalty function algorithm to reduce computational effort
N77-12739
An evaluation and comparison of three nonlinear programming codes
[AD-A024930] N77-12763
A subgradient procedure for the solution of minimax location problems
[AD-A025288] N77-12796
Applied mathematics
[AD-A025791] N77-12807
NONLINEAR SYSTEMS
Reduced order models for power system analysis
N77-12291
Asymmetrical oscillations in nonlinear systems
[AD-A024673] N77-12320
Distance constraints for tree network multifacility location problems
[AD-A025287] N77-12770
NONLINEARITY
A method for the analysis of nonlinearities in aircraft dynamic response to atmospheric turbulence
[NASA-TN-D-8265] N77-11992
NONUNIFORM FLOW
Analysis of supersonic unsteady cascades with the method of characteristics, volume I
[AD-A025909] N77-12342
Unsteady transonic flow with heat addition due to condensation
[AD-A025651] N77-12350
NORMAL DENSITY FUNCTIONS
Applications of generalized spline functions to empirical Bayes estimation
N77-12814
NORTH AMERICA
Crude oil supply alternatives for the Northern Tier states
[PB-255991/2] N77-12530
Short-period P wave attenuation along various paths in North America as determined from P wave spectra of the SALMON nuclear explosion
[AD-A025239] N77-12622

NORTH SEA
Research ship Meteor of the German Research Society and the German Hydrographical Institute. Voyage no. 35 [21 October - 21 November 1974] North Sea [RANOSP]
N77-12662

NORTHERN HEMISPHERE
Analysis of occurrence of sporadic E and accuracy of predictions of sporadic-E critical frequencies for Temperate Latitude Northern Hemisphere Stations
[PB-255875/7] N77-12268
PECHCV, PECHFV, PEFHCV and PEFHFV: A set of atmospheric, primitive equation forecast models for the Northern Hemisphere, volume 3
[NASA-CR-149027] N77-12637

NORWAY
Report from space
[NASA-TT-F-17504] N77-12482

NOSE WHEELS
The influence of heat treatment on the structure and properties of an isothermally forged Ti6-Al-6V-2Sn nose wheel and structural shape
[AD-A025473] N77-12195

NOTCH SENSITIVITY
Fatigue of notched fiber composite laminates. Part 2: Analytical and experimental evaluation
[NASA-CR-145039] N77-12133

NOTCH STRENGTH
On the dynamic stress concentration of notched plates as induced by tensile stress waves, volume 41, no. 4
[ISAS-540] N77-12434

NOTCH TESTS
Growth of part-through cracks in simple construction elements
[IFKM-76/1] N77-12439

NOZZLE DESIGN
Scramjet nozzle design and analysis as applied to a highly integrated hypersonic research airplane
[NASA-TN-D-8334] N77-11994

NOZZLE FLOW
Evaluation of insulation materials for advanced motor systems
[AD-A025306] N77-12124

NOZZLE THRUST COEFFICIENTS
Flow visualization of the turbulent jet at the exit of a single element nozzle by holographic technique, and mean velocity profile measurements with a laser Doppler anemometer
[AD-A025439] N77-12348

NUCLEAR CHEMISTRY
Preparative high performance liquid chromatography
N77-12156

NUCLEAR ELECTRIC POWER GENERATION
Costs of alternative sources of electricity
[PB-255765/0] N77-12528

NUCLEAR ELECTRIC PROPULSION
Pulsed thermionic converter study
[NASA-CR-149234] N77-12123

NUCLEAR EXPLOSIONS
Nuclear electromagnetic pulse simulation by point source injection techniques for shielded penetrations
[AD-A024803] N77-12276
Short-period P wave attenuation along various paths in North America as determined from P wave spectra of the SALMON nuclear explosion
[AD-A025239] N77-12622

NUCLEAR INTERACTIONS
The Frascati [e, e'p] experimental apparatus
[ISS-P-75/3] N77-12072

NUCLEAR POWER PLANTS
Investigation of stress corrosion of Inconel 600 and Incoloy 800 for steam generators
[BLL-RISLEY-TR-3038-[9091.9F]]
N77-12177
Net energy from nuclear power
[PB-254059/9] N77-12527

NUCLEAR RADIATION
An overview discussion of propagation effects of nuclear environments on VLF-LF communication systems
[AD-A024956] N77-12286

NUCLEAR ROCKET ENGINES
Pulsed thermionic converter study
[NASA-CR-149234] N77-12123

NUCLEAR SPIN
The superhyperfine structure of a system exhibiting the dynamic Jahn-Teller effect: CaF2:Sc[2+]
N77-12846

NUCLEAR WARFARE
Aircraft ionizing doses and dose rates from radioactive clouds and fallout
[AD-A024896] N77-12053

NUCLEATION
Heterogeneous nucleation and its influence on the structure of thin films
N77-12898
Contribution to Frenkel condensation theory
N77-12899

NUMERICAL ANALYSIS
Numerical methods and windtunnel testing
[AGARD-CP-210] N77-11969
Theoretical and experimental simulation methods for external store separation trajectories
N77-11981
Numerical simulation of three dimensional transonic flow including wind tunnel wall effects
N77-11984
Three-dimensional flow calculation for a transonic compressor rotor
N77-12019
A critical review of turbine flow calculation procedures
N77-12022
The numerical solution of the steady flow of Newtonian and non-Newtonian fluids through a contraction
[AD-A025774] N77-12344
Numerical analysis of fuel tank penetration dynamics
[AD-A025451] N77-12448
A program for the numerical solution of large sparse systems of algebraic and implicitly defined stiff differential equations
[AD-A024764] N77-12804
Numerical methods for stiff nonlinear and quadratic differential equations
[AD-A025200] N77-12810

NUMERICAL CONTROL
Data processing and industrial process control. Part 3: Numerical control [level 2 functions] and economic optimization [level 3 functions]
[CRIF-IN-3] N77-12776

NUMERICAL INTEGRATION
An optimal method for evaluating a class of convolution integrals with related kernels
[PB-251156/6] N77-12795

NUMERICAL WEATHER FORECASTING
US Naval Weather Service numerical environmental products manual
[AD-A024702] N77-12652
Data Assimilation Restorative-Iterative Model [RIMOD]
[AD-A024736] N77-12654

NUTS [FASTENERS]
Effect of self-locking nuts on torque-tension relationship
[AD-A024893] N77-12417

O

OBLIQUE SHOCK WAVES
A consistent finite-difference operator for time-dependent solution of steady, oblique shocks
[KTH-AERO-FI-47] N77-12331

OBSERVATION
Annals of meteorology no. 10: Development of meteorological observations in northern and central Germany up to 1700
[ISBN-3-88148-145-1] N77-12641

OCEAN SURFACE
Research, design, and development of the U.S. Coast Guard high seas oil containment system
[AD-A025749] N77-12573
Some aspects of the influence of abnormal eastern equatorial Pacific Ocean surface temperatures upon weather patterns in the southwestern United States, volume 2
[AD-A024710] N77-12651

OCEANOGRAPHIC PARAMETERS
Bibliography of Soviet Material on Internal Waves, no. 6, November 1975 - April 1976
[AD-A025813] N77-12664

OCEANOGRAPHY
Bounding the thickness of the oceanic magnetized layer
N77-12661
Working Conference on Oceanographic Data Systems
[AD-A025475] N77-12663

OCEANS
Sunlight and the ocean
[AD-A024678] N77-12665
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862
Origin of the earth's ocean and atmosphere
N77-12984

OCULOMOTOR NERVES
The vestibular system for eye movement control
N77-12674
Plasticity in the adult vestibulo-ocular reflex arc
N77-12675
An adaptive neural model compatible with plastic changes induced in the human vestibulo-ocular reflex by prolonged optical reversal of vision
N77-12676

OHIO
The Ohio land allocation model, phase 2
[E77-10042] N77-12472
Development of a multi-disciplinary ERTS user program in the state of Ohio
[E77-10045] N77-12475
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585
Financial critical factors analysis — waste treatment management for Miami Valley, Ohio region
[PB-254377/5] N77-12937

OIL POLLUTION
Investigate feasibility of utilizing acoustic emission methods to evaluate the integrity of a prototype ADAPTS oil storage container
[AD-A025910] N77-12425
Towed planning sled for delivery of oil pollution control equipment
[AD-A025247] N77-12569
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572
Temperature effects of crude oil in the upper intertidal zone
[PB-255956/5] N77-12581

OIL RECOVERY
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572

OIL SLICKS
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572
Research, design, and development of the U.S. Coast Guard high seas oil containment system
[AD-A025749] N77-12573

OILS
Hydraulic press: RDL Redcar
[PB-256050/6] N77-12414

OMEGA NAVIGATION SYSTEM
An assembler for the MOS Technology 6502 microprocessor as implemented in jolt [TM] and KIM-1 [TM]
[NASA-CR-149227] N77-12030
Analysis of in-flight omega data [data taken 26 January - 7 February 1969 are compared with predicted values for paths from Hawaii to San Diego, Samoa, and Wake and from Samoa and Wake to Hawaii]
[AD-A025926] N77-12037
Diurnal measurements with prototype CMOS Omega receivers
[NASA-CR-149160] N77-12606

OPERATIONS RESEARCH
Demonstration program for Omega receiver prototype microcomputer data processing
[NASA-CR-149226] N77-12029

OPERATOR PERFORMANCE
Feasibility of implementing specific performance measurement techniques
[AD-A025945] N77-12705

OPERATORS [MATHEMATICS]
A consistent finite-difference operator for time-dependent solution of steady, oblique shocks
[KTH-AERO-FI-47] N77-12331
The generalized trajectory simulation system. Volume 4: Numerical operators
[AD-A025436] N77-12755

OPHTHALMOLOGY
Flight fitness and pliant contact lenses
N77-12714

OPTICAL CORRECTION PROCEDURE
An adaptive neural model compatible with plastic changes induced in the human vestibulo-ocular reflex by prolonged optical reversal of vision
N77-12676
Concerning flight and the correction of presbyopia
N77-12713

OPTICAL COUPLING
Development of 20 percent efficient solar cell
[PB-255903/7] N77-12548

OPTICAL DATA PROCESSING
Development of an optical disc recorder
[AD-A025291] N77-12372
Digital orthophoto study Add-On
[AD-A025690] N77-12498
Imagery utilizing multiple focal planes
N77-12852

OPTICAL DENSITY
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388

OPTICAL EMISSION SPECTROSCOPY
Determination of correction factors by regression analysis for the analysis of sulfur using optical emission spectrometry
[PB-256052/2] N77-12205
Investigation of vacuum deposition processes by optical emission spectroscopy
N77-12851

OPTICAL EQUIPMENT
Thermoplastic modulator brassboard
[AD-A025450] N77-12317
Laser interferometer techniques for inspection of optical components
[AD-A025088] N77-12385

OPTICAL MEASUREMENT
Measurement of optical power radiated by Florida lightning
[AD-A025320] N77-12621

OPTICAL POLARIZATION
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862
OPTICAL PROPERTIES
Wind tunnel models for aero-optical interaction study
[AD-A024925] N77-12078
Optical studies of the stress-induced crystallization of rubbers
N77-12215
Symposium on the Fundamental Optical Properties of Solids Relevant to Solar Energy Conversion
[PB-256615/6] N77-12538
Predetection compensated imaging
[AD-A025190] N77-12870
Optical studies of bonding in solids
[AD-A024949] N77-12909
OPTICAL RADAR
Coherent Optical Adaptive Techniques [COAT]
[AD-A025668] N77-12280
OPTICAL REFLECTION
Reflective coatings reliability study
[AD-A025757] N77-12863
OPTICAL TRACKING
Investigation and evaluation of a Zero Input Tracking Analyzer [ZITA]
[AD-A025431] N77-12700
An adaptive prediction filter algorithm for optimizing servo system performance
[AD-A025980] N77-12873
OPTICAL TRANSFER FUNCTION
Image quality through the atmosphere
N77-12853
OPTICAL WAVEGUIDES
Research and development in glass technology related to fiber optic waveguides
[AD-A025660] N77-12867
OPTIMAL CONTROL
Results of some investigations of differential gain theory applied to air-to-air systems. Volume 2: Stochastic differential games with complexity constrained strategies for air-to-air systems
[AD-A025322] N77-12008
Alternatives for jet engine control
[NASA-CR-146531] N77-12058
OPTIMIZATION
Monotone data flow analysis frameworks: A formal theory of global computer program optimization
N77-12743
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777
Representations of unbounded optimizations as integer programs
[AD-A025603] N77-12798
Nonparametric probability density estimation by optimization theoretic techniques
N77-12816
A three phase model for controlled clinical trials
N77-12817
Pulse analysis of acoustic emission signals
N77-12831
Optimization in the study of a sinusoidal waveform of known periodicity in the presence of noise. Application in radio astronomy, 1
[NASA-TT-F-16764] N77-12955
ORBIT CALCULATION
The theory of the gravitational potential applied to orbit prediction
[NASA-TM-X-58186] N77-12092
Application of the multirevolution orbit prediction method
[ESA-CR[P]-840] N77-12093
ORBITAL MANEUVERS
Space shuttle navigation analysis
[NASA-CR-151113] N77-12112
ORBITAL POSITION ESTIMATION
Application of the multirevolution orbit prediction method
[ESA-CR[P]-840] N77-12093
ORGANIC COMPOUNDS
Ionization processes relevant to the formation of new materials
[AD-A025197] N77-12130
Matrix affinity chromatography and its application to the concentration and separation of trace organics in water
N77-12148
Structural defects in solids
N77-12894
Absorption of ultrasound in organic crystals
[AD-A025174] N77-12912
ORGANIC MATERIALS
The welding of organic coated steels and laminates
[PB-256056/3] N77-12416
ORGANIC WASTES [FUEL CONVERSION]
A bioenvironmental study of emissions from refuse derived fuel
[AD-A024661] N77-12571
ORGANOMETALLIC COMPOUNDS
Magnetic resonance studies of paramagnetic transition metal complexes
N77-12171
The welding of organic coated steels and laminates
[PP-256056/3] N77-12416
Axial effects in planar complexes: Iron tetraphenylporphyrinrin and nickel bisdiphenylglyoxime halides
N77-12890
ORTHOGONALITY
Topics in the application of summation methods --- described through a sequence of orthogonal polynomials
N77-12780
ORTHOPHOTOGRAPHY
Digital orthophoto study Add-On
[AD-A025690] N77-12498
ORTHOTROPIC PLATES
Fracture of composite orthotropic plates containing periodic buffer strips
N77-12131
OSCILLATING FLOW
MHD oscillatory flow past a semi-infinite flat plate
N77-12876
OSCILLATORS
Asymmetrical oscillations in nonlinear systems
[AD-A024673] N77-12320
OXIDATION RESISTANCE
Hot corrosion and oxidation studies of pure nickel and Ni-Cr, Ni-Si and Ni-Cr-Si alloys at 1000 C
[AD-A024708] N77-12201
OXIDATION-REDUCTION REACTIONS
The Redox flow system for solar photovoltaic energy storage
[NASA-TM-X-73562] N77-12522
Removal of algae from waste stabilization pond effluent
[PB-256512/5] N77-12593
OXIDES
Manufacturing unique glasses in space
[NASA-CR-150067] N77-12083
A comparison of practical and theoretical correction factors for use in X-ray fluorescence analysis of oxide materials
[PB-256054/8] N77-12165
OXYGEN
Oxygen accumulation in hypobaric chambers
[AD-A025860] N77-12073
Oxygen potential of uranium-plutonium oxide as determined by controlled-atmosphere thermogravimetry
N77-12152
Dissolved oxygen meter, model 57 [Yellow Springs Instrument Co., Inc., Ohio]
[PB-256754/3] N77-12378
The clustering of O2 and He to Li[+]
[AD-A025762] N77-12625
OXYGEN MASKS
Development of a speech amplifier system for use with the Navy A4 oxygen breathing apparatus and a proposed firefighting instructor's breathing device
[AD-A025184] N77-12321
OXYGEN METABOLISM
Metabolic rates in five animal populations after long-term exposure to sanguine/sea-farer ELF Electromagnetic fields in nature
[AD-A024955] N77-12668
OXYGEN RECOMBINATION
Investigations into new methods of analysis by atomic and molecular fluorescence and flame emission
N77-12150
OXYGEN REGULATORS
Aeromedical review of oxygen requirements of US Army aviators
[AD-A024726] N77-12688
OXYGEN SUPPLY EQUIPMENT
Aeromedical review of oxygen requirements of US Army aviators
[AD-A024726] N77-12688
OZONE
UV/ozone cleaning of surfaces
[AD-A024943] N77-12313

P

P WAVES
Short-period P wave attenuation along various paths in North America as determined from P wave spectra of the SALMON nuclear explosion
[AD-A025239] N77-12622
PACIFIC ISLANDS
Water resources data for Hawaii and other Pacific areas, water year 1975
[PB-256668/5] N77-12497
PACIFIC NORTHWEST [US]
Paleobiology and paleoecology of middle Cambrian algae from western North America
N77-12604
PACIFIC OCEAN
Some aspects of the influence of abnormal eastern equatorial Pacific Ocean surface temperatures upon weather patterns in the southwestern United States, volume 2
[AD-A024710] N77-12651
Mariners weather log, volume 20, number 3, May 1976
[PB-250014-03] N77-12659
Past air-sea interactions over the eastern North Pacific Ocean as revealed by tree-ring data
N77-12660
PACKING DENSITY
Investigations of column packing materials for gas solid chromatography
N77-12147
PADE APPROXIMATION
The behavior of the Pade table for the exponential
[AD-A025099] N77-12805
PALEOMAGNETISM
Contributions to paleomagnetism and rb-sr geochronology
N77-12605
PANEL FLUTTER
Analytical comparison of effects of solid-friction and viscous structural damping on panel flutter
[NASA-TN-D-8263] N77-12435
PANELS
Effect of low velocity impact damage on the compressive strength of graphite/epoxy hat-stiffened panels
[NASA-TM-X-73988] N77-12134
PARALLEL PROCESSING [COMPUTERS]
A survey of parallel algorithms in numerical linear algebra
[AD-A024792] N77-12754
Parallel arithmetic using serial arithmetic processors
N77-12783
PARAMETRIC AMPLIFIERS
Lithium iodate parametric oscillator
[AD-A025758] N77-12392
PARTIAL DIFFERENTIAL EQUATIONS
Periodic solutions of nonlinear hyperbolic partial differential equations
N77-12793
PARTICLE COLLISIONS
Some examples of transparent potentials in the classical approximation
[PM/76/6] N77-12794
PARTICLE PRODUCTION
Phenomenology of lepton production
[PM/76/5] N77-12848
PARTICLE SIZE DISTRIBUTION
A diffraction technique to measure size distribution of large airborne particles
[PB-255454/1] N77-12599
PARTICLE SPIN
Two particle unitary for helicity amplitudes with particles of arbitrary spin
N77-12843
PARTICLES
Flow of solid particles in gases
[AGARD-AG-222] N77-12352
French contribution to aerodynamics of gas-particle mixtures
N77-12353
Gas flows with solid particles: Research and development in Germany
N77-12354
Flow of solid particles in gases: Activities at the Von Karman Institute for Fluid Dynamics
N77-12356
Fundamentals and applications of gas-particle flow
N77-12357
PARTITIONS [MATHEMATICS]
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777
The exchange partition functions of the rigid asymmetric top
N77-12784
Set partitioning: A survey
[AD-A025600] N77-12828
PASSENGERS
Transit safety and security: A design framework
[PB-256518/2] N77-12951
PASSIVITY
Heat pipe materials compatibility
[NASA-CR-135069] N77-12182
PATENT APPLICATIONS
Auxiliary power system for activity cooled aircraft
[NASA-CASE-LAR-11626-1] N77-12332
PATTERN REGISTRATION
Mask pattern generation techniques
[AD-A025343] N77-12727
Low-cost data analysis systems for processing multispectral scanner data
[NASA-TR-R-467] N77-12767
PAVEMENTS
Cumulative deflection and rigid pavement serviceability
[AD-A024969] N77-12077
A laboratory evaluation of sulphur-asphalt paving mixtures
[PB-254911/1] N77-12441
California trials with Lean Concrete Base [LCB]
[PB-254035/9] N77-12443
Symposium on nondestructive test and evaluation of airport pavements
[AD-A025442] N77-12444
Evaluation of temperature effects on bituminous pavement deflections in Virginia
[PB-255955/7] N77-12456
Pavement surface dynamics friction measurement and analysis in Kansas
[PB-255490/5] N77-12459

PAYLOADS
Analytical study of lightweight acoustic shrouds for shuttle experiments and payloads
[NASA-CR-150116] N77-12113
PDP 11/20 COMPUTER
PDP-11 macro cross assembler
[AD-A025751] N77-12731
PEARSON DISTRIBUTIONS
Hydraulic functions of soils from physical experiments and their applications
N77-12471
Pearson curves revisited
[AD-A025696] N77-12809
PEELING
Scanning electron microscopy, ion scattering and secondary ion mass spectrometry to characterize apparent adhesive failure in an adhesive bond
[AD-A025615] N77-12442
PENETRATION
Numerical analysis of fuel tank penetration dynamics
[AD-A025451] N77-12448
PERFORMANCE PREDICTION
Comparison between the calculated and the experimental results of the compressor test cases
N77-12024
PERFORMANCE TESTS
Comparison between the calculated and the experimental results of the compressor test cases
N77-12024
Turbine test cases: Presentation of design and experimental characteristics
N77-12025
Turbines: Presentation of calculated data and comparison with experiments
N77-12026
Demonstration program for Omega receiver prototype microcomputer data processing
[NASA-CR-149226] N77-12029
A detector test for low background measurement
[ISS-T-75/11] N77-12991
PERIODICALS
Statistical indicators of scientific and technical communication [1960-1980]. Volume 3: A data appendix to volume 2
[PB-255503/5] N77-12927
PERMEABILITY
Adaptation of the Joppa method to a wind tunnel with variable permeability
N77-11976
Hydraulic functions of soils from physical experiments and their applications
N77-12471
PERSONNEL SELECTION
Investigation and evaluation of a Zero Input Tracking Analyzer [ZITA]
[AD-A025431] N77-12700
PERSPIRATION
The collection, analysis, and comparison of human sensible perspiration between sedentary and conditioned male caucasians as to the variation in selected electrolyte composition
N77-12669
PERTURBATION
Some experiences with the exploitation of measurements of the perturbation field in a wind tunnel to improve simulation
N77-11974
PERTURBATION THEORY
Toward a convergent perturbation theory
N77-12785
PETROLOGY
Characterization study of domestic nickeliferous laterites by electron optical and X-ray techniques
[PB-256699/0] N77-12499
PHASE DEMODULATORS
Receiving and tracking phase modulated signals
[NASA-CASE-MSC-16170-1] N77-12248
PHASE LOCKED SYSTEMS
Receiving and tracking phase modulated signals
[NASA-CASE-MSC-16170-1] N77-12248
PHASE MODULATION
Coherent Optical Adaptive Techniques [COAT]
[AD-A025669] N77-12395
PHASE SHIFT CIRCUITS
Low loss low hold power diode phase shifter development
[AD-A024779] N77-12312
PHASE SHIFT KEYING
Signal-to-noise ratios in a PCM/PSK system
[PB-255939/1] N77-12267
Simulation software of digital data detection methods. Part 1: Theoretical analysis. Part 2: Computer programs --- coherent and differentially coherent demodulation of M-phase PSK signals
[THA/320/RWO/JS-PT-1/2] N77-12769
PHASE TRANSFORMATIONS
Modified GRAY: An improved three-phase equation of state for metals
[AD-A025260] N77-12192
PHASED ARRAYS
Coherent Optical Adaptive Techniques [COAT]
[AD-A025668] N77-12280
A study of near-field data handling and probe design techniques
[AD-A024990] N77-12283
PHOSPHATES
Preparation and magnetic properties of titanium phosphate glass
N77-12213
Summary characterizations of selected chemicals of near-term interest
[PB-255817/9] N77-12591
PHOSPHORESCENCE
Luminescence properties of cyclic polynitramines
N77-12850
PHOTOCATHODES
Study of semiconductor surfaces using the technique of optical second harmonic generation
[AD-A024981] N77-12910
PHOTOCHEMICAL REACTIONS
Study of factors affecting reactions in environmental chambers
[PB-256252/8] N77-12167
Photochemical air pollution: Weekday-weekend differences
N77-12557
Mechanism of photochemically initiated oxidations
[PB-256397/1] N77-12575
Chemistry in the stratosphere
[PB-255862/5] N77-12633
PHOTOCHROMISM
Elastic and quasi-elastic laser light scattering of photochromic macromolecules
N77-12383
PHOTOCONDUCTORS
Absorptance calculations for a multilayer absorbing stack: Application to thin film photoconductor assemblies
[AD-A025798] N77-12868
PHOTODIODES
Optoelectronic devices packaged for fiber optics application, volume 1
[AD-A025905] N77-12861
PHOTODISSOCIATION
Photon interactions with atmospheric negative ions
[AD-A025770] N77-12163
PHOTOELASTIC ANALYSIS
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
PHOTOELASTIC MATERIALS
Wave propagations in orthogonally reinforced fiber composites. A discrete model for reinforced composites viewed as polar media
[AD-A025596] N77-12136
PHOTOGRAMMETRY
A new photogrammetric comparator design
[AD-A025977] N77-12503
PHOTOGRAPHIC EMULSIONS
Photographic plates for emission spectrographic analysis --- noting contrast, speed, and spectral response
[MQAD-R-234] N77-12371
Photographic emulsion threshold functions study
[AD-A025471] N77-12374
PHOTOGRAPHIC FILM
CPA color reversal study --- color film processing enhancement
[AD-A025899] N77-12373
PHOTOGRAPHIC PLATES
Photographic plates for emission spectrographic analysis --- noting contrast, speed, and spectral response
[MQAD-R-234] N77-12371
PHOTOGRAPHIC PROCESSING
CPA color reversal study --- color film processing enhancement
[AD-A025899] N77-12373
Low-cost data analysis systems for processing multispectral scanner data
[NASA-TR-R-467] N77-12767
PHOTOINTERPRETATION
Design handbook for imagery interpretation equipment
[AD-A025453] N77-12869
PHOTOIONIZATION
Method for isotope separation
[NASA-TT-F-16743] N77-12841
PHOTOMETRY
Geometric aspects of rocket photometry
[AD-A024947] N77-12629
PHOTOMICROGRAPHS
Measurements of the rheological properties of multipath polymeric systems
N77-12216
PHOTOMULTIPLIER TUBES
Two-photon correlations in a widely divergent light beam
N77-12854
PHOTON-ELECTRON INTERACTION
Photon interactions with atmospheric negative ions
[AD-A025770] N77-12163
Positron, electron and photon interaction experiments
[AD-A025482] N77-12908
PHOTONS
Two-photon correlations in a widely divergent light beam
N77-12854
PHOTOVOLTAIC CELLS
The Redox flow system for solar photovoltaic energy storage
[NASA-TM-X-73562] N77-12522
Review of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays
[NASA-CR-149215] N77-12524
Assessment of cadmium sulfide photovoltaic arrays for large scale electric utility applications
[PB-255646/2] N77-12551
PHYSIOLOGICAL EFFECTS
Effects of the physiological environment on the long-term physical performance of polymeric materials
[NASA-CR-149206] N77-12220
PHYSIOLOGICAL RESPONSES
The response to sound of identified reticulo-spinal cells
N77-12677
Human subjective and reflex responses to sinusoidal vertical acceleration
N77-12679
A model for analytic investigation of three-dimensional head-spine dynamics
[AD-A025911] N77-12686
Effects of sound on the vestibular system
[AD-A025969] N77-12690
Experimental study of vision dimming in an animal
N77-12716
PIEZOELECTRIC TRANSDUCERS
Manufacturing methods and techniques for piezoelectric transformers
[AD-A025176] N77-12323
PIEZOELECTRICITY
Investigation of piezoelectric effect in permanently polarized oxide glasses and glass-ceramics
[AD-A025144] N77-12325
PILOT ERROR
Spectrally balanced chromatic landing approach lighting system
[NASA-CASE-ARC-10990-1] N77-12031
PILOT PERFORMANCE
An analysis of the effect of a flight director on pilot performance in a helicopter hovering task
[AD-A025680] N77-12701
Test plot evaluation of a reclined cockpit seat as an aid to G tolerance and performance
[AD-A025784] N77-12703
Concerning flight and the correction of presbyopia
N77-12713
PILOTS [PERSONNEL]
Code of federal regulations. 14. Aeronautics and space, parts 1 to 59 --- federal aviation procedural rules and standards
N77-12932
Code of federal regulations. 14. Aeronautics and space, parts 60 to 199 --- federal aviation procedural rules and standards
N77-12933
PIPE FLOW
A program for the stability analysis of pipe Poiseuille flow
[AD-A024927] N77-12351
Hydrodynamic separation of solids from solid-liquid mixtures
[PB-254490/6] N77-12938
PIPELINES
Metallurgical factors controlling weld metal toughness in the seam welding of line pipe
[PB-256057/1] N77-12415
PITCH [INCLINATION]
The effect of various air density-altitude relations on the phugoid
[NASA-TT-F-17118] N77-11990
Mean flow and turbulence measurements in the wake of slender propeller-driven bodies including effects of pitch angle
[AD-A031088] N77-12337
PLANETARY EVOLUTION
Evolution of the solar system
[NASA-SP-345] N77-12959
Accretional processes
N77-12969
On the accretion of planets and satellites
N77-12970
Spin and accretion
N77-12971
Relations between comets and meteoroids
N77-12972
Plasma physics and hetegony
N77-12973
Model of the hetegonic plasma
N77-12974
Transfer of angular momentum and condensation of grains
N77-12975
Accretion of the condensation products
N77-12976
Transplanetary condensation
N77-12977

Chemical structure of the solar system
N77-12978
Meteorites and their precursor states
N77-12980
The properties of the early sun
N77-12983
Origin of the earth's ocean and atmosphere
N77-12984
Computer simulations of planetary accretion dynamics: Sensitivity to initial conditions
[NASA-CR-149214] N77-12988

PLANETARY MAGNETIC FIELDS
Jupiter and Saturn. Giants of the solar system
[NASA-TT-F-17274] N77-12986

PLANETARY ROTATION
Resonance structure in the solar system
N77-12966
Spin and tides
N77-12967
Post-accretional changes in the solar system
N77-12968
Spin and accretion
N77-12971

PLANETARY STRUCTURE
The structure of the groups of secondary bodies
N77-12981

PLANETS
The present structure of the planetary and satellite systems
N77-12960

PLANKTON
Relationship between water quality and plant growth in ponds
[PB-256513/3] N77-12594
Physical-chemical methods for the control of algal species and composition in algal culturing facilities
[PB-256784/0] N77-12600

PLANTS [BOTANY]
Review of present knowledge of plant injury by air pollution
[WMO-431] N77-12559
Physical-chemical methods for the control of algal species and composition in algal culturing facilities
[PB-256784/0] N77-12600

PLASMA DIAGNOSTICS
Laser diagnostics of laser-produced plasmas
[AD-A024936] N77-12880

PLASMA HEATING
The cold plasma throughout the magnetosphere — observed by Prognoz satellites
[D-230] N77-12612

PLASMA PHYSICS
Evaluation of the radiation field in a spherically symmetric plasma
[AD-A024922] N77-12284
Plasma physics and hetegony
N77-12973
Model of the hetegonic plasma
N77-12974
Transfer of angular momentum and condensation of grains
N77-12975
Transplanetary condensation
N77-12977

PLASMA WAVES
A region of intense plasma wave turbulence on auroral field lines
[NASA-CR-149209] N77-12620
Relativistic effects in resonance absorption
[AD-A025192] N77-12878

PLASMONS
Investigations of surfaces and interfaces using optical excitation of surface plasmons
[AD-A025285] N77-12162

PLASTIC DEFORMATION
Finite deformation of elastic-plastic and elastic/viscoplastic continua
N77-12429

PLASTIC PROPERTIES
Plasticity in the adult vestibulo-ocular reflex arc
N77-12675
An adaptive neural model compatible with plastic changes induced in the human vestibulo-ocular reflex by prolonged optical reversal of vision
N77-12676

PLATES
Vibration and sound radiation of a plate
[AD-A024985] N77-12464

PLATINUM
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289
Optimization of PT-doped Kocite [trademark] electrodes in H3 PO4 fuel cells
[AD-A025326] N77-12529

PLENUM CHAMBERS
Advanced porous transonic wind-tunnel nozzles
[NASA-TM-X-73180] N77-12069
A mathematical model for the starting process
[AD-A025692] N77-12076
Development of hydrazine gas generator/plenum system
[AD-A025931] N77-12126

PLOTTERS
Printer version of plots made by an incremental plotter
[AD-A025898] N77-12728

PLOTTING
The singular surface in the parameter space; applications
[AD-A024909] N77-12764

PLUMES
Investigation of jet plume effects on the longitudinal stability characteristics of a body of revolution with various fin configurations at Mach numbers from 0.2 to 2.3 [normal jet plume simulator]
[AD-A024978] N77-12006

PLUTONIUM OXIDES
Oxygen potential of uranium-plutonium oxide as determined by controlled-atmosphere thermogravimetry
N77-12152

PLUTONIUM 239
Review of radiochemical methods for Pu-239 detection in environmental and biological samples
[ISS-R-75/12] N77-12682

POINT SOURCES
Technology and physics of infrared and point contact diodes
[AD-A025330] N77-12896

POINTS [MATHEMATICS]
On finding K nearest neighbors in the plane
[AD-A025610] N77-12747

POLARIZED ELECTROMAGNETIC RADIATION
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862

POLAROGRAPHY
An economical square-wave polarograph for electrochemical analysis
N77-12149
Differential coulostatic polarography
N77-12154

POLICIES
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures
[PB-255222/2] N77-12943
An overview of Federal technology transfer
[PB-255693/4] N77-12953

POLLUTION CONTROL
Research, design, and development of the U.S. Coast Guard high seas oil containment system
[AD-A025749] N77-12573
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585

POLLUTION MONITORING
Photochemical air pollution: Weekday-weekend differences
N77-12557
An analysis of data input systems and a survey of other data bases for the Naval environmental Protection Support Service [NEPSS]
[AD-A035085] N77-12564
Species-differentiating continuous monitor for airborne acids
[AD-A025917] N77-12570
Directory of air quality monitoring sites active in 1974
[PB-256708/9] N77-12578

POLYCRYSTALS
Further development and application of polycrystalline metal whiskers
[BMFT-FB-T-76-18] N77-12219
Electrical properties of polycrystalline ceramic insulators
[AD-A025312] N77-12221

POLYESTERS
Interactions of water with hydrophilic polyether polyurethanes
N77-12214

POLYIMIDE RESINS
Study of processing and properties of graphite fiber/high temperature resin composites
[AD-A024733] N77-12141

POLYMER CHEMISTRY
Interactions of water with hydrophilic polyether polyurethanes
N77-12214
Measurements of the rheological properties of multipath polymeric systems
N77-12216

POLYMERIZATION
The diastereosequence distribution resulting from a two-state mechanism involving first order Markovian addition steps
N77-12129
Processing of polymeric materials
[PB-255986/2] N77-12225

POLYMERS
Preliminary evaluation of ATQ polymer as a potential matrix resin
[AD-A025897] N77-12222
A study of the drag characteristics and polymer diffusion in the boundary layer of an axisymmetric body
[AD-A024667] N77-12227
Development of highly oriented polymers with improved mechanical properties
[AD-A024988] N77-12228

POLYNOMIALS
Topics in the application of summation methods — described through a sequence of orthogonal polynomials
N77-12780

PONDS
Removal of algae from waste stabilization pond effluent
[PB-256512/5] N77-12593
Relationship between water quality and plant growth in ponds
[PB-256513/3] N77-12594

POPULATION THEORY
Classification rules for exponential populations: Two parameter case
[AD-A025181] N77-12811
Classification techniques appropriate for unequal covariance matrices
N77-12815

POPULATIONS
Priorities in air pollution source control: Modeling of population exposures and health effects
N77-12558
Some sequential designs for the selection of the best binomial population
N77-12813
A technique for detecting the number of populations falling within a total sample
[AD-A025701] N77-12820
Urban densities for public transportation
[PB-256636/2] N77-12952

POROUS BOUNDARY LAYER CONTROL
Advanced porous transonic wind-tunnel nozzles
[NASA-TM-X-73180] N77-12069

PORPHYRINS
Axial effects in planar complexes: Iron tetraphenylporphyrinrin and nickel bisdiphenylglyoxime halides
N77-12890

PORTABLE EQUIPMENT
A VHF transmitter and system synchronizer for use in a portable Doppler radar system
[PB-256094/4] N77-12270
Remote portable solar powered microwave system
[AD-A025978] N77-12556
Portable N wave generators of different power for simulation of sonic booms
[ISL-R-123/75] N77-12833

POSITION [LOCATION]
An analysis of the position location and reporting system's performance characteristics
[AD-A025437] N77-12038
Environmental position errors of the GPS. Army user equipment
[AD-A025940] N77-12101
Magnetosphere dynamics by localization of ultra low frequency waves
[CEPHAG-3/76] N77-12614
Distance constraints for tree network multifacility location problems
[AD-A025287] N77-12770

POSITION ERRORS
Environmental position errors of the GPS. Army user equipment
[AD-A025940] N77-12101

POSITION INDICATORS
Development of a Distress Alerting and Locating System [DALS]
[AD-A023841] N77-12034
Terrestrial radiodetermination potential users and their requirements
[PB-255839/3] N77-12035
Narrow-band passive systems theory with applications to positioning and navigation
[AD-A025743] N77-12036
Position-fixing and position-predicting programs for the Hewlett-Packard model 9830A programmable calculator
[AD-A024972] N77-12751

POSITRON ANNIHILATION
Positron, electron and photon interaction experiments
[AD-A025482] N77-12908

POTENTIAL FIELDS
Some examples of transparent potentials in the classical approximation
[PM/76/6] N77-12794

POWDER METALLURGY
Consolidation of Beta 3 titanium alloy spherical metal powders by hot swaging
[AD-A025469] N77-12196
Fabrication and evaluation of hot isostatically pressed beryllium
[AD-A024780] N77-12198

POWER AMPLIFIERS
Production engineering measure for an integrated circuit power amplifier 600 - 1000 MHz, for tactical radio equipment
[AD-A025919] N77-12307

POWER CONDITIONING
Advanced power processing techniques for DC to DC converters
[AD-A025915] N77-12306

POWER LINES
Transients in low voltage power system: Descriptions of transients observed in the area of Copenhagen in some industries, hospitals, offices, laboratories, etc.
[ECR-63] N77-12294
Feasibility study of the use of current limiting devices in interruption and sectionalizing of DC circuits in mines
[PB-256541/4] N77-12322

POWER PLANTS
Reduced order models for power system analysis
N77-12291

POWER REACTORS
The behaviour of impurities in a steady-state DT gas-blanket reactor — ion-ion and electron-ion collision contribution to Nernst effect
[REPT-75-90] N77-12877

POWER SPECTRA
Incremental technique for absolute measurement of coherent power at millimeter and submillimeter wavelengths
[AD-A025201] N77-12285
An assessment of prewhitening in estimating power spectra of atmospheric turbulence at long wavelengths
[NASA-TN-D-8288] N77-12610
Spectral analysis of a univariate process with bad data points, via maximum entropy and linear predictive techniques
[AD-A024942] N77-12756

PREDICTION ANALYSIS TECHNIQUES
Through-flow calculations in axial turbomachinery
[AGARD-CP-195] N77-12013
Through-flow calculations based on matrix inversion: Loss prediction
N77-12016
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158
Performance measurements over long line-of-sight microwave links in Colorado
[PB-256261/9] N77-12266
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 2: Computation of the capacitance matrixes for ribbon cables
[AD-A025029] N77-12305
A study of the crack damage in fuel-filled tank walls due to ballistic penetrators
[AD-A025430] N77-12449
Theoretical analysis of ATJS graphite disks fractured by spinning
[AD-A024711] N77-12451
Growth effects of major land use projects. Volume 3: Summary
[PB-256204/9] N77-12583

PREDICTION RECORDING
Methods of predicting blast loads inside and outside suppressive structures
[AD-A024906] N77-12466

PREDICTIONS
Application of the multirevolution orbit prediction method
[ESA-CR[P]-840] N77-12093

PRESBYOPIA
Concerning flight and the correction of presbyopia
N77-12713

PRESSURE DISTRIBUTION
Experimental and theoretical analysis of transonic flow around a sphere
N77-11987
Vortex simulation of the pressure field of a jet
[NASA-TM-X-73984] N77-11989
Analysis of pressure distortion testing
[NASA-CR-2766] N77-12041

PRESSURE DRAG
Investigation of very low blockage ratio boattail models in the Langley 16-foot transonic tunnel
[NASA-TN-D-8335] N77-11998

PRESSURE DROP
Analysis of pressure distortion testing
[NASA-CR-2766] N77-12041

PRESSURE GRADIENTS
Investigation of boundary layer-like flows with pressure gradients at high freestream Mach numbers
[ESA-TT-348] N77-12338

PRESSURE REDUCTION
An empirical technique for predicting flow curves
N77-12327
A study of boundary layer and mass bleed in a short length supersonic diffuser for a gas dynamic laser
[AD-A025673] N77-12394

PRESSURE WELDING
Hot pressure welding of aluminum alloys
[AD-A025966] N77-12419

PRESSURIZED WATER REACTORS
Investigation of stress corrosion of Inconel 600 and Incoloy 800 for steam generators
[BLL-RISLEY-TR-3038-[9091.9F]]
N77-12177
Reflood heat transfer in a light water reactor
[PB-256481/3] N77-12345

PRESTRESSING
Prestress tendons on short radius curves
[PB-256015/9] N77-12458
Durability and behavior of prestressed concrete beams. Report 5: Laboratory tests of weathered pretensioned beams
[AD-A025694] N77-12462

PROBABILITY DENSITY FUNCTIONS
Nonparametric probability density estimation by optimization theoretic techniques
N77-12816

PROBABILITY THEORY
Another look at the concept of model
[UCRL-77896] N77-12790
Nonparametric probability density estimation by optimization theoretic techniques
N77-12816

PROBES
A study of near-field data handling and probe design techniques
[AD-A024990] N77-12283

PROBLEM SOLVING
Periodic solutions of nonlinear hyperbolic partial differential equations
N77-12793

PROCUREMENT POLICY
The application of design-to-cost acquisition policies to selected electronics subsystem development programs
[AD-A024895] N77-12931

PRODUCT DEVELOPMENT
Thick and thinfilm inductors: An investigation of design and manufacturing parameters for VHF and UHF inductors made in film techniques
[ECR-64] N77-12296
Product assurance programme plan for high reliability products
[ECR-59] N77-12424
Review of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays
[NASA-CR-149215] N77-12524

PRODUCTION ENGINEERING
NS-4 coating process development for columbium alloy airfoils
[AD-A025797] N77-12139
Engineering efficiency of high unit-capacity metallurgical units
[NLL-M-25379-[5828.4F]] N77-12175
Storage camera tube with non-destructive readout
[AD-A024280] N77-12301
Advanced integrated-circuit technology for micropower ICs. Integrated circuits
[AD-A025507] N77-12303
Production engineering measure for an integrated circuit power amplifier 600 - 1000 MHz, for tactical radio equipment
[AD-A025919] N77-12307
Data processing and industrial process control. Part 3: Numerical control [level 2 functions] and economic optimization [level 3 functions]
[CRIF-IN-3] N77-12776
A comparison of several attribute sampling plans
[AD-A025700] N77-12821

PRODUCTION MANAGEMENT
Product assurance programme plan for high reliability products
[ECR-59] N77-12424

PRODUCTION PLANNING
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090

PROGRAMMING LANGUAGES
FENIX: The LRLTRAN compiler for the STAR
[UCID-30128] N77-12722
FORESTER: A language for morphological analysis of hierarchical systems, with reference to structural exegesis of the synoptic traditions
N77-12740
SOL-370 language reference manual and users' guide
[AD-A025927] N77-12753
Distributed computation study
[AD-A024670] N77-12774

PROJECT PLANNING
A methodology for the evaluation of program cost and schedule risk for the SEASAT program
[NASA-CR-149230] N77-12478
Evaluation of water quality models: A management guide for planners
[PB-256412/8] N77-12574
Air quality considerations in transportation planning: Findings and recommendations on transportation control planning, phase 2
[PB-256424/3] N77-12576
Our natural resources: What is our water worth. 1975 - 1978 water quality management planning program, North Central Texas Council of Governments
[PB-256976/2] N77-12947

PROPANE
Petroleum market shares. Report on sales of propane to ultimate consumers, 1975
[PB-255624/9] N77-12540

PROPELLANT ADDITIVES
Effect of a chromium-containing fuel additive on hot corrosion
[NASA-TM-X-73465] N77-12184

PROPELLANT GRAINS
Solid propellants for hydrogen gas generators
[AD-A025974] N77-12235

PROPELLANT STORAGE
A survey of salt deposits and salt caverns: Their relevance to the strategic petroleum reserve
[PB-255948/2] N77-12500

PROPELLER DRIVE
Mean flow and turbulence measurements in the wake of slender propeller-driven bodies including effects of pitch angle
[AD-A031088] N77-12337

PROPELLER EFFICIENCY
Advanced V/STOL propeller critical components investigation
[AD-A024663] N77-12063

PROTECTIVE CLOTHING
Effectiveness of four water cooled undergarments and a water cooled cap in reducing heat stress
[AD-A025216] N77-12696

PROTECTIVE COATINGS
NS-4 coating process development for columbium alloy airfoils
[AD-A025797] N77-12139
Sputtering
[NASA-TM-X-73527] N77-12236
Reflective coatings reliability study
[AD-A025757] N77-12863

PROTON SCATTERING
Spin dependence at very high energies in an eikonal picture of pp elastic scattering
N77-12842

PROTONS
The Frascati [e, e'p] experimental apparatus
[ISS-P-75/3] N77-12072

PSYCHOMOTOR PERFORMANCE
Investigation and evaluation of a Zero Input Tracking Analyzer [ZITA]
[AD-A025431] N77-12700

PSYCHOPHYSICS
Digital color image processing and psychophysics within the framework of a human visual model
N77-12849

PSYCHOPHYSIOLOGY
Image descriptors for display
[AD-A024960] N77-12871

PUBLIC LAW
Transit safety and security: A design framework
[PB-256518/2] N77-12951

PUBLIC RELATIONS
An evaluation of public hearings on water development projects in Mississippi
[PB-256583/6] N77-12944

PULSE CODE MODULATION
Differential pulse code modulation
[NASA-CASE-MSC-12506-1] N77-12239
Signal-to-noise ratios in a PCM/PSK system
[PB-255939/1] N77-12267

PULSE COMMUNICATION
Differential pulse code modulation
[NASA-CASE-MSC-12506-1] N77-12239
Moment space error bounds for digital communication systems with intersymbol interference based on nth moment
[AD-A025013] N77-12288

PULSED LASERS
Laser pyrolysis gas chromatography and plasma stoichiometric analysis
N77-12145

PUPILLOMETRY
A free head-movement pupillometer system
[AD-A025900] N77-12698

PYROLYSIS
Laser pyrolysis gas chromatography and plasma stoichiometric analysis
N77-12145

Q

QUALITY CONTROL
Instrumentation and equipment for testing highway materials, products, and performance
[PB-256138/9] N77-12377
Quality assurance handbook for air pollution measurement systems. Volume 1: Principles
[PB-254658/8] N77-12567

QUANTUM MECHANICS
Quantum mechanical analysis of intramolecular interactions
N77-12838
On the semi-classical expansion in quantum mechanics for arbitrary Hamiltonians
[AD-A025441] N77-12917
WKB expansions by path integrals, with applications to the anharmonic oscillator
[AD-A025440] N77-12918

QUANTUM THEORY
Intense pulse phenomena
[AD-A025483] N77-12845
On the semi-classical expansion in quantum mechanics for arbitrary Hamiltonians
[AD-A025441] N77-12917

QUARTZ LAMPS
Spectral sensitivity calibration of spectrophotometers --- using standard tungsten quartz lamp
[AML-R7602] N77-12370
QUATERNARY ALLOYS
Interaction of aqueous electrolytes and quaternary ammonium salts
N77-12155
QUEUEING THEORY
On finding K nearest neighbors in the plane
[AD-A025610] N77-12747

R

RADAR EQUIPMENT
Final engineering report for Goldstone operations support radar
[NASA-CR-149239] N77-12244
Multiple Target Instrumentation Radar [MTIR] study, phase 2, add-on
[AD-A025939] N77-12272
Multimode phased array tube
[AD-A025691] N77-12316
RADAR IMAGERY
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243
RADAR RANGE
Assembling of the range partials into the range word in the ACMI system
[AD-A024770] N77-12287
RADAR SCATTERING
Laboratory calibration of AAFE radiometer/scatterometer [RADSCAT]
[NASA-TM-X-73900] N77-12363
RADAR SIGNATURES
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243
RADAR TRACKING
Narrow-band passive systems theory with applications to positioning and navigation
[AD-A025743] N77-12036
Assembling of the range partials into the range word in the ACMI system
[AD-A024770] N77-12287
RADAR TRANSMITTERS
Development and fabrication of a space hardened Nd[+3] YAG laser transmitter system for orbital range and altitude control
[AD-A025155] N77-12107
Colloquium on Solid State Transmitters for Radar
[AD-A025189] N77-12255
A VHF transmitter and system synchronizer for use in a portable Doppler radar system
[PB-256094/4] N77-12270
Multidither adaptive algorithms
[AD-A025185] N77-12765
RADIANT FLUX DENSITY
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862
RADIATION ABSORPTION
Effects of radiation penetration on snowmelt runoff hydrographs
[AD-A025763] N77-12489
RADIATION DAMAGE
An overview discussion of propagation effects of nuclear environments on VLF-LF communication systems
[AD-A024956] N77-12286
RADIATION DISTRIBUTION
Time domain radiation fields of a monopole antenna
[AD-A025619] N77-12252
RADIATION DOSAGE
Aircraft ionizing doses and dose rates from radioactive clouds and fallout
[AD-A024896] N77-12053
Radiation exposure of the Italian population due to medical diagnostic examinations in 1974
[ISS-P-75/13] N77-12683
Adjoint Monte Carlo generated radiation response functions for the B-1 aircraft
[AD-A025756] N77-12687
RADIATION EFFECTS
Study of the effects of radiation on the electrical and optical properties of HgCdTe
[AD-A025222] N77-12257
Survey of radiation effects in metal insulator semiconductor devices
[AD-A024809] N77-12311
Metabolic rates in five animal populations after long-term exposure to sanguine/sea-farer ELF Electromagnetic fields in nature
[AD-A024955] N77-12668
RADIATION HARDENING
Development and fabrication of a space hardened Nd[+3] YAG laser transmitter system for orbital range and altitude control
[AD-A025155] N77-12107
RADIATION MEASUREMENT
Theory of thin screen scintillations for a spherical wave
[NASA-TM-X-71225] N77-12857
RADIATION MEASURING INSTRUMENTS
Listing of solar radiation measuring equipment and glossary
[NASA-CR-150064] N77-12507
RADIATION PRESSURE
Dynamic interaction of shells and plates with the ambient medium
N77-12432
RADIATION SHIELDING
Adjoint Monte Carlo generated radiation response functions for the B-1 aircraft
[AD-A025756] N77-12687
RADIATIVE HEAT TRANSFER
Radiational heat exchange between surfaces with anisotropic radiation
[NLL-M-25350-[5828.4F]] N77-12328
Error analysis of minimum information and Smith's direct methods for inverting the radiative transfer equation
[AD-A025478] N77-12865
RADIATIVE TRANSFER
Evaluation of the radiation field in a spherically symmetric plasma
[AD-A024922] N77-12284
RADIO ASTRONOMY
Optimization in the study of a sinusoidal waveform of known periodicity in the presence of noise. Application in radio astronomy, 1
[NASA-TT-F-16764] N77-12955
RADIO COMMUNICATION
ARPA internetwork protocols project
[AD-A024823] N77-12260
ARPA internetwork protocols project
[AD-A024819] N77-12261
TCP resynchronization
[AD-A024822] N77-12262
Evaluation of radio communications for use by individual fire fighters
[AD-A025936] N77-12273
RADIO DIRECTION FINDERS
Development of a Distress Alerting and Locating System [DALS]
[AD-A023841] N77-12034
RADIO EQUIPMENT
The horizontally polarized dipole antenna as a solution to the problems of high frequency short range communications
[AD-A025674] N77-12277
Production engineering measure for an integrated circuit power amplifier 600 - 1000 MHz, for tactical radio equipment
[AD-A025919] N77-12307
RADIO FREQUENCIES
Incremental technique for absolute measurement of coherent power at millimeter and submillimeter wavelengths
[AD-A025201] N77-12285
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289
RADIO FREQUENCY INTERFERENCE
Systems and methods for determining radio frequency interference
[NASA-CASE-GSC-12150-1] N77-12247
An overview discussion of propagation effects of nuclear environments on VLF-LF communication systems
[AD-A024956] N77-12286
RADIO NAVIGATION
Terrestrial radiodetermination potential users and their requirements
[PB-255839/3] N77-12035
RADIO RELAY SYSTEMS
Systems and methods for determining radio frequency interference
[NASA-CASE-GSC-12150-1] N77-12247
RADIO TRANSMISSION
Analysis of in-flight omega data [data taken 26 January - 7 February 1969 are compared with predicted values for paths from Hawaii to San Diego, Samoa, and Wake and from Samoa and Wake to Hawaii]
[AD-A025926] N77-12037
Evaluation of radio communications for use by individual fire fighters
[AD-A025936] N77-12273
RADIO TRANSMITTERS
Remote portable solar powered microwave system
[AD-A025978] N77-12556
RADIOACTIVE CONTAMINANTS
Review of radiochemical methods for Pu-239 detection in environmental and biological samples
[ISS-R-75/12] N77-12682
Health implications of the risks connected with the use of americium 241 for lightning protection — metabolism and pathological effects, and radioprotection
[ISS-R-75/16] N77-12684
RADIOCHEMICAL SEPARATION
Review of radiochemical methods for Pu-239 detection in environmental and biological samples
[ISS-R-75/12] N77-12682
RADIOMETERS
Support of the infrared radiometer on the ST
[NASA-CR-144818] N77-12361
RADIOSONDES
Synoptic thermal wind calculations from radiosonde observations over the southwestern United States
[AD-A025693] N77-12655
RADIOTELEPHONES
An integrated system approach for automatic switching radio telephony
[AD-A024889] N77-12265
RAIN
Method of computing the influence of spherically laminar inhomogeneities on tropospheric refraction and contribution to the radio refraction of mists, cloudiness and rain
N77-12242
RAINSTORMS
National several local storms operation plan
[PB-256717/0] N77-12658
RAMAN SPECTRA
Determination of the torsional barriers around single bonds by vibrational spectroscopy
N77-12153
Application of coherent anti-Stokes Raman scattering to measurements of gas concentrations in aerodynamic flows
[ESA-TT-331] N77-12160
Resonance-enhanced allowed, field-induced and wave-vector-dependent Raman scattering from the surface region of InAs
N77-12887
RAMS [PRESSES]
Hydraulic press: RDL Redcar
[PB-256050/6] N77-12414
RANDOM ACCESS MEMORY
The role of coding in multiple-access satellite communication systems
[AD-A025612] N77-12116
RANDOM NOISE
Results of some investigations of differential gain theory applied to air-to-air systems. Volume 2: Stochastic differential games with complexity constrained strategies for air-to-air systems
[AD-A025322] N77-12008
Moment space error bounds for digital communication systems with intersymbol interference based on nth moment
[AD-A025013] N77-12288
RANDOM VARIABLES
Two related goodness-of-fit problems with applications to spacings
[AD-A025699] N77-12808
RANGEFINDING
Performance of a range-ambiguous MTI and Doppler filter system
[AD-A025683] N77-12278
RAPID TRANSIT SYSTEMS
Personal rapid transit research conducted at the Aerospace Corporation
[PB-256846/7] N77-12946
RARE EARTH COMPOUNDS
Growth of single crystals of some rare-earth-cobalt compounds R2Co17, from the melt
[AD-A025141] N77-12913
RAY TRACING
Vignetting characteristics of the S-056 X-ray telescope
[NASA-CR-150107] N77-12859
REACTION KINETICS
Emission spectroscopical investigation of the system F2-H2 in a shock tube
[ESA-TT-349] N77-12161
Metal vapor visible laser kinetics program
[AD-A025004] N77-12400
A survey of kinetic data of compounds containing flourine
[NASA-TM-X-73983] N77-12609
REACTOR MATERIALS
Fracture toughness of pressure vessel materials for light water reactors
[AD-A025808] N77-12461
READERS
Recognition of coded symbols on reading out data
[NLL-M-24126-[5828.4F]] N77-12924
READING
Pilot opinion of flight displays and monitoring gauges in the UH-1 helicopter
[AD-A024714] N77-12579
READOUT
Storage camera tube with non-destructive readout
[AD-A024280] N77-12301
REAL TIME OPERATION
Applications of the real-time data analysis system in the Ames 40- by 80-foot wind tunnel
N77-11972
Automatic control of a transonic wind tunnel with a real-time computer system
N77-11977
A visual display system for the HP 2100A computer
[R-1-76] N77-12723
REATTACHED FLOW
Supersonic aircraft after body study of a thick boundary layer on a two-dimensional step
[LRBA-E-815-PV-4/SAE] N77-12001

RECEIVERS
Demonstration program for Omega receiver prototype microcomputer data processing
[NASA-CR-149226] N77-12029
Receiving and tracking phase modulated signals
[NASA-CASE-MSC-16170-1] N77-12248
RECORDING INSTRUMENTS
Development of an optical disc recorder
[AD-A025291] N77-12372
RECRYSTALLIZATION
Formation of an impeded recrystallization zone during the annealing of low-alloy molybdenum alloys
[NLL-M-25349-[5828.4F]] N77-12174
REENTRY TRAJECTORIES
The generalized trajectory simulation system. Volume 4: Numerical operators
[AD-A025436] N77-12755
REFLECTORS
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388
REFLEXES
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 --- reflex movements of the eye
[DRB-DR-225] N77-12671
Plasticity in the adult vestibulo-ocular reflex arc
N77-12675
An adaptive neural model compatible with plastic changes induced in the human vestibulo-ocular reflex by prolonged optical reversal of vision
N77-12676
Human subjective and reflex responses to sinusoidal vertical acceleration
N77-12679
REFRACTION
Charge transport and the photorefractive effect in doped and undoped lithium tantalate
N77-12358
REFRACTIVITY
Laser interferometer techniques for inspection of optical components
[AD-A025088] N77-12385
REGIONAL PLANNING
Planning applications in east central Florida
[E77-10044] N77-12474
Urban and regional research in Sweden 1974-1975. An annotated list
[PB-256201/5] N77-12949
REGRESSION ANALYSIS
An analysis of the position location and reporting system's performance characteristics
[AD-A025437] N77-12038
Determination of correction factors by regression analysis for the analysis of sulfur using optical emission spectrometry
[PB-256052/2] N77-12205
Past air-sea interactions over the eastern North Pacific Ocean as revealed by tree-ring data
N77-12660
Systematic development of methodologies in planning urban water resources for medium size communities phase 1
[PB-256565/3] N77-12940
REINFORCED PLASTICS
Interlaminar strength of laminated polymeric matrix composites
[AD-A024722] N77-12138
An assessment of the fracture resistance of three chopped-fiber reinforced phenolic materials
[AD-A024672] N77-12142
REINFORCING FIBERS
Wave propagations in orthogonally reinforced fiber composites. A discrete model for reinforced composites viewed as polar media
[AD-A025596] N77-12136
Investigate fiber reinforced Si13N4
[AD-A025901] N77-12137
Thermomechanics of fiber-reinforced composites
[AD-A024948] N77-12140
RELATIVISTIC EFFECTS
Relativistic effects in resonance absorption
[AD-A025192] N77-12878
RELIABILITY
Interprocess communication protocols for computer networks
[AD-A025508] N77-12254
RELIABILITY ANALYSIS
Microcircuit device reliability linear/interface microcircuit data
[AD-A019433] N77-12300
Traveling-wave tube reliability estimates, life tests, and space flight experience
[NASA-TM-X-73541] N77-12423
Modeling reliability and maintainability characteristics of production systems via the Markov process
[AD-A025121] N77-12426
Rapping reentrainment in a nearly full-scale pilot electrostatic precipitator
[PB-255984/7] N77-12595
Reliability evaluation MNOS arrays
[AD-A025776] N77-12900
RELIABILITY ENGINEERING
Reliability of deposited glass
[AD-A024664] N77-12226
Product assurance programme plan for high reliability products
[ECR-59] N77-12424
Feasibility study for a direct, air-cooled condensation system
[PB-256403/7] N77-12537
REMOTE SENSORS
Quarterly literature review of the remote sensing of natural resources, third quarter 1976 --- bibliography
[NASA-CR-149163] N77-12470
Remote sensing of variations of sea-ice-surfaces in the Barents-Sea from 1966 - 1975 by means of satellite data, among others NOAA-VHRR
N77-12484
Remote sensing of geothermic activities of the volcanoes Aetna, Stromboli and Vesuv by means of infrared NOAA-VHRR-satellite data --- Italy
N77-12485
Effect of sun angle, atmospheric attenuation, and turbulence on mirror beacons for LANDSAT image control
[PB-255404/6] N77-12488
Programmer's guide for REMAPP REMote Sensing Array Processing Procedures
[PB-256693/3] N77-12758
REMOTELY PILOTED VEHICLES
Controllers and autopilot modes for RPV simulation program
[AD-A025792] N77-12051
Conceptual study of a low cost turbojet engine
[AD-A025652] N77-12062
REPORTS
French space program. Report to COSPAR --- covering mid-1975 to mid-1976 period
N77-12086
SOVRAD: A digest of recent Soviet R and D articles, volume 2, number 3, 1976
[AD-A025814] N77-12994
RESCUE OPERATIONS
Development of a Distress Alerting and Locating System [DALS]
[AD-A023841] N77-12034
RESEARCH AND DEVELOPMENT
Development and application of a low cost gas dynamic laser test facility
[AD-A025648] N77-12074
Outlook for research and development in the underground gasification of coal
[PB-256155/3] N77-12555
Research and development in glass technology related to fiber optic waveguides
[AD-A025660] N77-12867
Superconductivity: A changing R and D scene in Germany
[AD-A025445] N77-12906
Research and technology objectives and plans. A summary, FY 1977 research and technology program
[NASA-TM-X-74296] N77-12925
An overview of Federal technology transfer
[PB-255693/4] N77-12953
RESEARCH FACILITIES
Research ship Meteor of the German Research Society and the German Hydrographical Institute. Voyage no. 35 [21 October - 21 November 1974] North Sea [RANOSP]
N77-12662
USSR Academy of Medical Sciences
[JPRS-68310] N77-12693
RESEARCH MANAGEMENT
Research and Development Management Analysis System [RDMAS]
[AD-A025447] N77-12920
RESEARCH PROJECTS
SOVRAD: A digest of recent Soviet R and D articles, volume 2, number 3, 1976
[AD-A025814] N77-12994
RESIDENTIAL AREAS
Evaluation of the air-to-air heat pump for residential space conditioning
[PB-255652/0] N77-12545
RESINS
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
RESONANCE
Resonance structure in the solar system
N77-12966
RESOURCE ALLOCATION
Economics of depletable resources: Market forces and intertemporal bias
[PB-255623/1] N77-12930
RESOURCES MANAGEMENT
Crude supply alternatives for the Northern Tier states. Volume 1: Executive summary
[PB-255992/0] N77-12531
Crude supply alternatives for the Northern Tier states. Volume 2: Technical report
[PB-255993/8] N77-12532
A compilation of papers presented at the 208 Areawide Water Quality Management Workshops
[PB-254663/8] N77-12561
RETAINING
Ball bearings for gyroscope axis. Simple movements of the retainer
[LRBA-E-602-NT-49/SIE] N77-12408
RETENTION [PSYCHOLOGY]
The effect of continuous noise on short term memory performance tasks
[AD-A025446] N77-12694
The effect of auditory and visual presentation of navigational messages on message retention
[PB-256599/2] N77-12706
RETINAL ADAPTATION
Protection from retinal burns and flashblindness due to atomic flash
N77-12711
REVERSED FLOW
Turbulent atmospheric flow over a backward-facing step
[NASA-CR-2749] N77-12639
REVIEWING
Analysis of strip line dispersion
N77-12298
REVOLVING
Application of the multirevolution orbit prediction method
[ESA-CR[P]-840] N77-12093
RHEOLOGY
Measurements of the rheological properties of multipath polymeric systems
N77-12216
RIGID STRUCTURES
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158
An analytical model for uniaxial cyclic inelastic behavior of reinforced concrete
[AD-A024910] N77-12465
The exchange partition functions of the rigid asymmetric top
N77-12784
RING LASERS
Ring Laser Attitude System
[AD-A025769] N77-12390
RING WINGS
An experimental investigation of the Whistler nozzle and an analytical investigation of a ring wing in supersonic flow
[AD-A025672] N77-12009
RIVERS
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473
ROADS
Neurophysiology and road safety: Contribution of the frontal lobes to visual orienting
N77-12672
ROBOTS
Task descriptors for automated assembly
[PB-255545/6] N77-12410
ROCKET ENGINE DESIGN
Comparative analysis of designs and implementations of reaction flying vehicles proposed during the nineteenth and beginning of the twentieth centuries
[NASA-TT-F-16749] N77-12081
ROCKET ENGINES
Ignition phase blast field of tube or silo launched rockets: Inviscid, chemically reacting flow model
[AD-A025198] N77-12106
Thermal-environment testing of a 30-cm engineering model thruster
[NASA-TM-X-73522] N77-12121
ROCKET EXHAUST
On the simulation of an underexpanded propulsive jet for the investigation of the static longitudinal stability of an axially symmetric flight vehicle in supersonic flow
[ESA-TT-334] N77-12004
Effect of the constrictive area ratio on the rocket exhaust flow-field in the launcher
[AD-A024657] N77-12127
ROCKET FLIGHT
Max Valier: A pioneer of space travel
[NASA-TT-F-664] N77-12993
ROCKET LAUNCHING
Effect of the constrictive area ratio on the rocket exhaust flow-field in the launcher
[AD-A024657] N77-12127
ROCKET PROPELLED SLEDS
Ring Laser Attitude System
[AD-A025769] N77-12390
ROCKET SOUNDING
Energy spectra of electrons with energies 3 keV probably accelerated in onteraction of the injected electron beam with the ionospheric plasma in Araks experiment --- onboard Eridan sounding rocket
[D-222] N77-12611
ROCKET VEHICLES
Comparative analysis of designs and implementations of reaction flying vehicles proposed during the nineteenth and beginning of the twentieth centuries
[NASA-TT-F-16749] N77-12081
ROCKET-BORNE INSTRUMENTS
General purpose rocket furnace
[NASA-CASE-MFS-23460-1] N77-12070
ROCKS
Weathering and weatherability of rocks: Experiments on thermal fatigue of non-igneous rocks
[AD-A025598] N77-12619

ROLLER BEARINGS
Roller bearing geometry design
[NASA-CR-135082] N77-12403
Analysis of cage motion
[AD-A025735] N77-12412
ROTARY WING AIRCRAFT
Validation of the rotorcraft flight simulation program [C81] for articulated rotor helicopters through correction with flight data
[AD-A025934] N77-12045
ROTARY WINGS
The use of computers in rotary wing testing
N77-11973
Correlation of full-scale helicopter rotor performance in air with model-scale Freon data
[NASA-TN-D-8323] N77-11999
Army preliminary evaluation JOH-58A helicopter with low reflective paint and infrared countermeasure exhaust system
[AD-A024727] N77-12042
A new capability for predicting helicopter rotor noise in hover and in flight
[NASA-CR-147138] N77-12064
ROTOR BLADES
Development of erosion resistant claddings for helicopter rotor blades
[AD-A024894] N77-12054
ROTOR BLADES [TURBOMACHINERY]
A device for detecting amplitudes of vibration of turbodynamo blades
[NLL-M-24095-[5828.4F]] N77-12360
ROTORS
An experimental investigation of the flap-lag stability of a hingeless rotor with comparable levels of hub and blade stiffness in hovering flight
[NASA-CR-151924] N77-12040
RUDDERS
Advanced composite rudders for DC-10 aircraft: Design, manufacturing, and ground tests
[NASA-CR-145068] N77-12039
RUNWAY CONDITIONS
Analysis of dynamic aircraft response to bomb damage repair
[AD-A025647] N77-12047
Heat and thrust requirements of a thermal fog dispersal system
[AD-A025112] N77-12648
RUNWAY LIGHTS
Spectrally balanced chromatic landing approach lighting system
[NASA-CASE-ARC-10990-1] N77-12031
RUNWAYS
Symposium on nondestructive test and evaluation of airport pavements
[AD-A025442] N77-12444

S

SAFETY DEVICES
A passive personal sampler for nitrogen dioxide
[PB-254447/6] N77-12565
SAFETY FACTORS
Implementation of proven technology in making the highway environment safe
[PB-256664] N77-12950
Transit safety and security: A design framework
[PB-256518/2] N77-12951
SAFETY MANAGEMENT
Neurophysiology and road safety: Contribution of the frontal lobes to visual orienting
N77-12672
SALINITY
Chloride management in Lake Erie Basin
[PB-256241/1] N77-12584
SAMPLES
Automatic multiple-sample applicator and electrophoresis apparatus
[NASA-CASE-ARC-10991-1] N77-12157
SAMPLING
Investigation of the effect of inspection error on sequential sampling plans
[AD-A024760] N77-12427
Some sequential designs for the selection of the best binomial population
N77-12813
A comparison of several attribute sampling plans
[AD-A025700] N77-12821
A subject selection problem employing a new criterion
[AD-A025803] N77-12822
Estimation of parameters of zero-one processes by interval sampling
[AD-A025698] N77-12823
SAPPHIRE
A theoretical study of the permanent and transient effects of ionizing radiation on the electrical performance of metal oxide semiconductor on sapphire inverters
[AD-A024752] N77-12904
SATELLITE ANTENNAS
Numerical investigations of monopole antenna systems on conducting cylinders --- satellite antennas
[R-166] N77-12250
SATELLITE ATTITUDE CONTROL
Passive attitude stabilization of satellites --- magnetic and gravity gradient methods
[VTH-176] N77-12100
SATELLITE COMMUNICATIONS SHIPS
Mobile terminal access to the advanced command-control architectural testbed
[AD-A025818] N77-12281
SATELLITE GROUND SUPPORT
Report from space
[NASA-TT-F-17504] N77-12482
SATELLITE INSTRUMENTS
Thermal vacuum qualification tests on a Dornier medium speed despin mechanism
[ESA-ESTL-20] N77-12409
SATELLITE NETWORKS
Environmental position errors of the GPS. Army user equipment
[AD-A025940] N77-12101
SATELLITE OBSERVATION
The cold plasma throughout the magnetosphere --- observed by Prognoz satellites
[D-230] N77-12612
The radiation and energy budgets of the earth using both ground-based and satellite-derived values of total cloud cover
[PB-256756/8] N77-12632
A plan for application system verification tests: The value of improved meteorological information, volume 1 --- economic consequences of improved meteorological information
[NASA-CR-149210] N77-12634
A plan for application system verification tests. The value of improved meteorological information, volume 2 --- economic consequence of improved meteorological information
[NASA-CR-149169] N77-12635
A plan for application system verification tests--The value of improved meteorological information: Executive summary --- economic consequence of improved meteorological information
[NASA-CR-149168] N77-12636
Solar and magnetospheric science
[NASA-TM-X-3440] N77-12990
SATELLITE ORBITS
LANDSAT 1 US cumulative catalog, 1975 - 1976
[NASA-TM-X-74298] N77-12468
LANDSAT 1 non-US cumulative catalog, 1975 - 1976
[NASA-TM-X-74297] N77-12469
LANDSAT US standard catalog --- LANDSAT imagery for July 1976
[NASA-TM-X-74261] N77-12490
LANDSAT US standard catalog
[GSFC/LU-76/008] N77-12491
LANDSAT non-US standard catalog --- LANDSAT imagery for July 1976
[NASA-TM-X-74259] N77-12492
LANDSAT non-US standard catalog --- LANDSAT imagery for August 1976
[NASA-TM-X-74258] N77-12493
SATELLITE POWER TRANSMISSION [TO EARTH]
Space-to-earth power transmission system
[NASA-TM-X-73489] N77-12517
SATELLITE SOLAR POWER STATIONS
Space-to-earth power transmission system
[NASA-TM-X-73489] N77-12517
SATELLITE-BORNE PHOTOGRAPHY
LANDSAT 1 US cumulative catalog, 1975 - 1976
[NASA-TM-X-74298] N77-12468
LANDSAT 1 non-US cumulative catalog, 1975 - 1976
[NASA-TM-X-74297] N77-12469
USA report proposes: An end to free satellite pictures
[NASA-TT-F-16732] N77-12479
Report from space
[NASA-TT-F-17504] N77-12482
An application of ERTS technology to the evaluation of coal strip mining and reclamation in the northern Great Plains
[NASA-CR-149208] N77-12486
LANDSAT US standard catalog --- LANDSAT imagery for July 1976
[NASA-TM-X-74261] N77-12490
LANDSAT US standard catalog
[GSFC/LU-76/008] N77-12491
LANDSAT non-US standard catalog --- LANDSAT imagery for July 1976
[NASA-TM-X-74259] N77-12492
LANDSAT non-US standard catalog --- LANDSAT imagery for August 1976
[NASA-TM-X-74258] N77-12493
SATURN [PLANET]
Jupiter and Saturn. Giants of the solar system
[NASA-TT-F-17274] N77-12986
SCALE MODELS
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 1
[NASA-CR-147646] N77-12109
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 2
[NASA-CR-147647] N77-12110
A low speed wind tunnel test of a 0.050 scale model of shuttle orbiter [model 089B] to investigate the longitudinal and lateral directional effects of canard and tail configurational modifications in the LTV LSWT [MA14]
[NASA-CR-147649] N77-12111
SCATTERING AMPLITUDE
Two particle unitary for helicity amplitudes with particles of arbitrary spin
N77-12843
SCATTEROMETERS
Laboratory calibration of AAFE radiometer/scatterometer [RADSCAT]
[NASA-TM-X-73900] N77-12363
SCENE ANALYSIS
An algorithm for the analysis of reconnaissance imagery
[AD-A025964] N77-12487
Telecommunications and society, 1976-1991: Report to office of telecommunications policy executive Office of the President
[PB-256829/3] N77-12942
SCHEDULING
Some sequential designs for the selection of the best binomial population
N77-12813
SCHREIBERSITE
Schreibersite growth and its influence on the metallography of coarse structured iron meteorites
N77-12958
SCIENTISTS
Max Valier: A pioneer of space travel
[NASA-TT-F-664] N77-12993
SCINTILLATION
Theory of thin screen scintillations for a spherical wave
[NASA-TM-X-71225] N77-12857
SEA ICE
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473
Remote sensing of variations of sea-ice-surfaces in the Barents-Sea from 1966 - 1975 by means of satellite data, among others NOAA-VHRR
N77-12484
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572
SEA WATER
Physical and biological aspects of thermal pollution in sea water --- forecasting electric power production in Italy
[ISS-L-75/14] N77-12560
Physical-chemical methods for the control of algal species and composition in algal culturing facilities
[PB-256784/0] N77-12600
SEASAT PROGRAM
SEASAT: A candidate ocean industry economic verification experiments
[NASA-CR-149228] N77-12476
SEATSAT programs option analysis
[NASA-CR-149229] N77-12477
A methodology for the evaluation of program cost and schedule risk for the SEASAT program
[NASA-CR-149230] N77-12478
SEATS
Full-scale crash test of a CH-47C helicopter
[NASA-TM-X-3412] N77-12027
Test plot evaluation of a reclined cockpit seat as an aid to G tolerance and performance
[AD-A025784] N77-12703
SECONDARY INJECTION
Secondary gas injection into a supersonic conical nozzle --- induced flow distribution
N77-12336
SECURITY
A secure voice system with bandwidth reduction
[AD-A025433] N77-12275
SEDIMENTS
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473
SEISMIC WAVES
Short-period P wave attenuation along various paths in North America as determined from P wave spectra of the SALMON nuclear explosion
[AD-A025239] N77-12622
SEISMOGRAMS
Seismic discrimination
[AD-A025777] N77-12627
SELENIDES
Structural relaxation of enthalpy and heat capacity of As2Se3 glass
[AD-A025018] N77-12229
SELENIUM COMPOUNDS
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
SELF ADAPTIVE CONTROL SYSTEMS
Coherent Optical Adaptive Techniques [COAT]
[AD-A025668] N77-12280

SEMICONDUCTING FILMS
Multitarget sputtering using decoupled plasmas
[AD-A025609] N77-12895
SEMICONDUCTOR DEVICES
Evaluation of augmenter light-off detection systems
[AD-A025321] N77-12061
Survey of radiation effects in metal insulator semiconductor devices
[AD-A024809] N77-12311
Fluid cooling of high power density semiconductor devices
[AD-A025815] N77-12314
SEMICONDUCTORS [MATERIALS]
Structural defects in solids
N77-12894
Semiconductors under high pressure
[AD-A025323] N77-12897
Properties of electron gas in constant magnetic and electric fields
[AD-A025464] N77-12905
Optical studies of bonding in solids
[AD-A024949] N77-12909
Study of semiconductor surfaces using the technique of optical second harmonic generation
[AD-A024981] N77-12910
SEPARATION
Segregation effects and the toughness of high-strength steels
[AD-A025299] N77-12190
SEPARATORS
Species-differentiating continuous monitor for airborne acids
[AD-A025917] N77-12570
SEQUENCING
Investigation of the effect of inspection error on sequential sampling plans
[AD-A024760] N77-12427
SEQUENTIAL ANALYSIS
A three phase model for controlled clinical trials
N77-12817
SERIES [MATHEMATICS]
Parallel arithmetic using serial arithmetic processors
N77-12783
A replacement policy for components of a pure series system utilizing one component as an indicator of replacement time
[AD-A024979] N77-12825
SERUMS
Effects of acceleration on selected serum enzymes
[AD-A025965] N77-12691
SERVOCONTROL
A study of servo accelerometer design for low frequency vibration measurement --- of large structures
[ISVR-TR-85] N77-12369
SERVOMECHANISMS
An adaptive prediction filter algorithm for optimizing servo system performance
[AD-A025980] N77-12873
SET THEORY
Uniform approximation of continuous functions on open subsets of R to the m power
N77-12786
A subject selection problem employing a new criterion
[AD-A025803] N77-12822
Set partitioning: A survey
[AD-A025600] N77-12828
SEWAGE TREATMENT
Removal of algae from waste stabilization pond effluent
[PB-256512/5] N77-12593
Hydrodynamic separation of solids from solid-liquid mixtures
[PB-254490/6] N77-12938
SHAFTS [MACHINE ELEMENTS]
An empirical design procedure for shafts with fatigue loadings
[AD-A024785] N77-12457
SHALE OIL
Synthesis and analysis of jet fuel from shale oil and coal syncrudes
[NASA-CR-135112] N77-12230
SHELL THEORY
On asymptotic expansions and error bounds in the derivation of two-dimensional shell theory
[AD-A025677] N77-12452
SHIFT REGISTERS
An approach to global register allocation
[AD-A024966] N77-12735
SHIP TERMINALS
Position-fixing and position-predicting programs for the Hewlett-Packard model 9830A programmable calculator
[AD-A024972] N77-12751
SHIPS
Waves generated by a uniformly moving oscillatory surface effect ship
[AD-A025129] N77-12011
Multiplexing techniques for advanced surface craft
[X76-979/301] N77-12245
Turbulent flux estimates from shipboard mean wind and temperature profiles and dissipation rates
[AD-A025438] N77-12650
Research ship Meteor of the German Research Society and the German Hydrographical Institute. Voyage no. 35 [21 October - 21 November 1974] North Sea [RANOSP]
N77-12662
SHOCK TESTS
Exploding wire shock test facility
[AD-A024924] N77-12079
SHOCK TUBES
Emission spectroscopical investigation of the system F2-H2 in a shock tube
[ESA-TT-349] N77-12161
SHOCK WAVE ATTENUATION
Equations of state and impact-induced shock-wave attenuation on the moon
[NASA-CR-149245] N77-12987
SHOCK WAVES
Application of computed shock standoff distances for windtunnel calibration at supersonic Mach numbers less than 1.2 --- using Schlieren photography
N77-11980
Distortion of weak shock and sound waves by atmospheric turbulence
[ESA-TT-355] N77-12616
SHORELINES
Comparison of computer simulation models with field data from nearshore environments
[AD-A025682] N77-12734
SHORT TAKEOFF AIRCRAFT
Wind tunnel investigation of internally blown jet-flap STOL airplane model
[NASA-TN-D-8309] N77-11995
SHROUDS
Analytical study of lightweight acoustic shrouds for shuttle experiments and payloads
[NASA-CR-150116] N77-12113
SIGNAL ANALYZERS
Wave analyzer dynamic range and bandwidth requirements for signal noise analysis
[AD-A024671] N77-12282
SIGNAL DETECTION
Simulation software of digital data detection methods. Part 1: Theoretical analysis. Part 2: Computer programs --- coherent and differentially coherent demodulation of M-phase PSK signals
[THA/320/RWO/JS-PT-1/2] N77-12769
SIGNAL DETECTORS
Diurnal measurements with prototype CMOS Omega receivers
[NASA-CR-149160] N77-12606
SIGNAL DISTORTION
Multidither adaptive algorithms
[AD-A025185] N77-12765
SIGNAL ENCODING
Recognition of coded symbols on reading out data
[NLL-M-24126-[5828.4F]] N77-12924
SIGNAL PROCESSING
The maximum liklihood method applications to DAASM studies
[AD-A025223] N77-12258
Digital processing and analysis of active multispectral data
[AD-A025009] N77-12401
Stochastic approximation with correlated data
[AD-A024279] N77-12819
SIGNAL TO NOISE RATIOS
Signal-to-noise ratios in a PCM/PSK system
[PB-255939/1] N77-12267
Optimization in the study of a sinusoidal waveform of known periodicity in the presence of noise. Application in radio astronomy, I
[NASA-TT-F-16764] N77-12955
SIGNAL TRANSMISSION
A binary to gray code converter for incorporation in a data modem
[SRDE-76002] N77-12249
SIGNATURE ANALYSIS
Pulse analysis of acoustic emission signals
N77-12831
SILANES
Low cost silicon solar array project. Task 1: Establishment of the feasibility of a process capable of low cost, high volume production of silane, SiH4
[NASA-CR-149238] N77-12514
SILICA GLASS
Investigation of piezoelectric effect in permanently polarized oxide glasses and glass-ceramics
[AD-A025144] N77-12325
SILICIDES
NS-4 coating process development for columbium alloy airfoils
[AD-A025797] N77-12139
SILICON
Effects of iron and silicon content on stress corrosion cracking in a thermomechanically processed aluminum alloy
[AD-A025165] N77-12210
Simplifier cut core inductor design
[NASA-CR-149241] N77-12292
Dip coating process: Silicon sheet growth development for the large-area silicon sheet task of the low-cost silicon solar array project
[NASA-CR-149242] N77-12513
Large area silicon sheet by EFG
[C-500] N77-12515
Analysis of epitaxial drift field N on P silicon solar cells
[NASA-TM-X-73563] N77-12523
Low reflectivity solar cells
[AD-A025922] N77-12539
Analysis of carrier concentration and mobility in boron-doped silicon
N77-12886
Inverse mean free path, stopping power, CSDA range, and straggling in silicon and silicon dioxide for electrons of energy less than or equal to 10 keV
[AD-A025488] N77-12902
SILICON DIOXIDE
Inverse mean free path, stopping power, CSDA range, and straggling in silicon and silicon dioxide for electrons of energy less than or equal to 10 keV
[AD-A025488] N77-12902
SILICON FILMS
Chemical vapor deposition growth
[NASA-CR-149233] N77-12516
SILICON NITRIDES
Investigate fiber reinforced Si13N4
[AD-A025901] N77-12137
SILICON RADIATION DETECTORS
Silicon monolithic infrared detector array
[X76-1117/034A] N77-12858
SIMILARITY THEOREM
Similar solutions of the differential equations for mean velocities, turbulence energy and turbulence length
[ESA-TT-354] N77-12339
SIMULATION
Some experiences with the exploitation of measurements of the perturbation field in a wind tunnel to improve simulation
N77-11974
Theoretical and experimental simulation methods for external store separation trajectories
N77-11981
SINE WAVES
Optimization in the study of a sinusoidal waveform of known periodicity in the presence of noise. Application in radio astronomy, I
[NASA-TT-F-16764] N77-12955
SINTERING
Engineering efficiency of high unit-capacity metallurgical units
[NLL-M-25379-[5828.4F]] N77-12175
SKEWNESS
Roller bearing geometry design
[NASA-CR-135082] N77-12403
SKIN TEMPERATURE (BIOLOGY)
The behaviour of skin temperature profiles in the forearm of a nude resting subject at air temperatures from 24 C to 34 C
[REPT-69] N77-12681
SKYLAB PROGRAM
Analysis of Skylab follow-on orbital neutron environmental data
[NASA-CR-150109] N77-12368
SLEDS
Towed planning sled for delivery of oil pollution control equipment
[AD-A025247] N77-12569
SLEEP
Automated electroencephalography system and electroencephalographic correlates of space motion sickness, part 2 --- sleep characteristics
[NASA-CR-151106] N77-12680
SMELTING
Evaluation of SO2 emission control technology applicable to the East Helena lead smelter
[PB-255277/6] N77-12580
SMOG
Study of factors affecting reactions in environmental chambers
[PB-256252/8] N77-12167
SNEAK CIRCUIT ANALYSIS
Software sneak circuit analysis
[AD-A024718] N77-12310
SNOW COVER
Effects of radiation penetration on snowmelt runoff hydrographs
[AD-A025763] N77-12489
SOCIAL FACTORS
Telecommunications and society, 1976-1991: Report to office of telecommunications policy executive Office of the President
[PB-256829/3] N77-12942
SODIUM COMPOUNDS
Thermal energy storage material thermophysical property measurement and heat transfer impact
[NASA-CR-135098] N77-12510
SOIL MOISTURE
Hydraulic functions of soils from physical experiments and their applications
N77-12471
SOILS
Progress report on the corrosion behavior of selected stainless steels in soil environments
[PB-256329/4] N77-12202
A universal impedance for soils
[AD-A025759] N77-12624

SOLAR ARRAYS
Review of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays
[NASA-CR-149215] N77-12524
SOLAR CELLS
Web-dendritic ribbon growth
[NASA-CR-149237] N77-12512
Dip coating process: Silicon sheet growth development for the large-area silicon sheet task of the low-cost silicon solar array project
[NASA-CR-149242] N77-12513
Low cost silicon solar array project. Task 1: Establishment of the feasibility of a process capable of low cost, high volume production of silane, SiH4
[NASA-CR-149238] N77-12514
Large area silicon sheet by EFG
[C-500] N77-12515
Status of silicon solar cell technology
[NASA-TM-X-73531] N77-12519
The Redox flow system for solar photovoltaic energy storage
[NASA-TM-X-73562] N77-12522
Analysis of epitaxial drift field N on P silicon solar cells
[NASA-TM-X-73563] N77-12523
Low reflectivity solar cells
[AD-A025922] N77-12539
Solar cell observables reduction techniques
[AD-A025923] N77-12541
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
Development of 20 percent efficient solar cell
[PB-255903/7] N77-12548
High-efficiency thin-film GaAs solar cells
[PB-255821/1] N77-12550
Thin film solar cells for terrestrial applications
[PB-255606/6] N77-12553
Remote portable solar powered microwave system
[AD-A025978] N77-12556
SOLAR COLLECTORS
Flat-plate solar collector handbook. A survey of principles, technical data and evaluation results
[UCID-17086] N77-12506
Outdoor performance results for NBS Round Robin collector no. 1
[NASA-TM-X-73547] N77-12520
SOLAR ENERGY
Measured performance of a 3 ton LiBr absorption water chiller and its effect on cooling system operation
[NASA-TM-X-73496] N77-12518
SOLAR ENERGY CONVERSION
Status of silicon solar cell technology
[NASA-TM-X-73531] N77-12519
The feasibility of solar energy usage on Red River Army Depot
[AD-A025119] N77-12535
Symposium on the Fundamental Optical Properties of Solids Relevant to Solar Energy Conversion
[PB-256615/6] N77-12538
Development of 20 percent efficient solar cell
[PB-255903/7] N77-12548
SOLAR GENERATORS
Costs of alternative sources of electricity
[PB-255765/0] N77-12528
SOLAR HEATING
Temperature distribution of a hot water storage tank in a simulated solar heating and cooling system
[NASA-TM-X-73549] N77-12521
The feasibility of solar energy usage on Red River Army Depot
[AD-A025119] N77-12535
SOLAR ORBITS
The motion of planets and satellites
N77-12961
Kepler motion of interacting bodies; jet streams
N77-12964
Resonance structure in the solar system
N77-12966
Post-accretional changes in the solar system
N77-12968
SOLAR PHYSICS
Solar and magnetospheric science
[NASA-TM-X-3440] N77-12990
SOLAR RADIATION
Effects of radiation penetration on snowmelt runoff hydrographs
[AD-A025763] N77-12489
Listing of solar radiation measuring equipment and glossary
[NASA-CR-150064] N77-12507
SOLAR SYSTEM
Evolution of the solar system
[NASA-SP-345] N77-12959
The present structure of the planetary and satellite systems
N77-12960
The motion of planets and satellites
N77-12961
The small bodies
N77-12962
Forces acting on small bodies
N77-12963
Kepler motion of interacting bodies; jet streams
N77-12964
Collisions: Fragmentation and accretion
N77-12965
Resonance structure in the solar system
N77-12966
Spin and tides
N77-12967
Post-accretional changes in the solar system
N77-12968
Accretional processes
N77-12969
On the accretion of planets and satellites
N77-12970
Spin and accretion
N77-12971
Relations between comets and meteoroids
N77-12972
Chemical structure of the solar system
N77-12978
Mass distribution and the critical velocity
N77-12979
Meteorites and their precursor states
N77-12980
The structure of the groups of secondary bodies
N77-12981
Origin and evolution of the Earth-Moon system
N77-12982
The properties of the early sun
N77-12983
SOLID LUBRICANTS
Ceramic airframe bearings
[AD-A025142] N77-12420
SOLID PHASES
Investigations of column packing materials for gas solid chromatography
N77-12147
Directionally solidified iron-base eutectic alloys
[NASA-TN-D-8354] N77-12185
SOLID PROPELLANT ROCKET ENGINES
Evaluation of insulation materials for advanced motor systems
[AD-A025306] N77-12124
SOLID PROPELLANTS
Analysis and characterization of high purity talc for use in propellants; determination of talc in propellants
[AD-A025122] N77-12234
Solid propellants for hydrogen gas generators
[AD-A025974] N77-12235
SOLID SOLUTIONS
Distribution of electron density in a transitional metal impurity in dilute substitution solid solutions
[NLL-M-25348-[5828.4F]] N77-12173
SOLID STATE
Symposium on the Fundamental Optical Properties of Solids Relevant to Solar Energy Conversion
[PB-256615/6] N77-12538
SOLID STATE DEVICES
Colloquium on Solid State Transmitters for Radar
[AD-A025189] N77-12255
Storage camera tube with non-destructive readout
[AD-A024280] N77-12301
Solid state research, 1975: 4
[AD-A025489] N77-12901
SOLID STATE LASERS
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387
Solid state research, 1975: 4
[AD-A025489] N77-12901
SOLID STATE PHYSICS
Solid state research, 1975: 4
[AD-A025489] N77-12901
SOLID WASTES
A bioenvironmental study of emissions from refuse derived fuel
[AD-A024661] N77-12571
Laboratory procedure for the potential heat determination in solid wastes
[PB-256378/1] N77-12586
SOLIDIFICATION
Low-gravity processing of superconducting compounds
[NASA-CR-150106] N77-12183
SOLIDS
Gas flows with solid particles: Research and development in Germany
N77-12354
A review of research in the United Kingdom in the field of multiple flows of solids and gases
N77-12355
Flow of solid particles in gases: Activities at the Von Karman Institute for Fluid Dynamics
N77-12356
Solid electrolyte battery materials
[AD-A024658] N77-12542
Investigation of anharmonic self-energies in some ionic and displacive ferroelectric solids
N77-12882
SOLVENT EXTRACTION
Laboratory analysis of solvent refined coal
[PB-255550/6] N77-12598
SONIC BOOMS
Portable N wave generators of different power for simulation of sonic booms
[ISL-R-123/75] N77-12833
SOUND GENERATORS
Portable N wave generators of different power for simulation of sonic booms
[ISL-R-123/75] N77-12833
SOUND TRANSMISSION
Vibration and sound radiation of a plate
[AD-A024985] N77-12464
A program of study on the aggregation of molecules and their effect on sound propagation
[AD-A025767] N77-12835
SOUND WAVES
A tensile testing experiment correlating load with acoustic emission
[AD-A024813] N77-12450
Distortion of weak shock and sound waves by atmospheric turbulence
[ESA-TT-355] N77-12616
Computational techniques for the study of infrasound propagation in the atmosphere
[AD-A024951] N77-12836
Absorption of ultrasound in organic crystals
[AD-A025174] N77-12912
SOUNDING ROCKETS
Single channel monopulse converter
[AD-A025485] N77-12117
SPACE COMMUNICATION
Space communication system for compressed data with a concatenated Reed-Solomon-Viterbi coding channel
[NASA-CASE-NPO-13545-1] N77-12240
SPACE DEBRIS
A comparison of spacecraft penetration hazards due to meteoroids and manmade earth-orbiting objects
[NASA-TM-X-73978] N77-12119
SPACE DENSITY
Spectrophotometry of cool stars in the near infrared. Part 3: Results for a region in the direction of l 2 = 138 deg
[ISBN-0-902553-13-5] N77-12957
SPACE FLIGHT TRAINING
Entrance of mankind into space [15th anniversary of the first manned flight into space]
[NASA-TT-F-17114] N77-12082
SPACE LABORATORIES
Review study and evaluation of possible flight experiments relating to cloud physics experiments in space
[NASA-CR-150066] N77-12638
SPACE MANUFACTURING
Manufacturing unique glasses in space
[NASA-CR-150067] N77-12083
SPACE NAVIGATION
Space shuttle navigation analysis
[NASA-CR-151113] N77-12112
SPACE SHUTTLE ORBITERS
Effect of specific configuration changes on the aerodynamics of the MSC-040-A orbiter at transonic speeds
[ESA-TT-332] N77-12002
Transonic stability and control characteristics of a 0.015 scale model 69-0 of the space shuttle orbiter with forebody RSI modification in the NASA/LaRC 8 foot TPT [LA72]
[NASA-CR-147644] N77-12108
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 1
[NASA-CR-147646] N77-12109
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 2
[NASA-CR-147647] N77-12110
A low speed wind tunnel test of a 0.050 scale model of shuttle orbiter [model 089B] to investigate the longitudinal and lateral directional effects of canard and tail configurational modifications in the LTV LSWT [MA14]
[NASA-CR-147649] N77-12111
Evaluation of selected space shuttle orbiter antenna systems
N77-12238
SPACE SHUTTLES
Space shuttle navigation analysis
[NASA-CR-151113] N77-12112
Analytical study of lightweight acoustic shrouds for shuttle experiments and payloads
[NASA-CR-150116] N77-12113
Preliminary vibration, acoustic, and shock design and test criteria for components on the SRB, ET, and SSME
[NASA-TM-X-64868] N77-12114
Onboard experiment data support facility. Task 2 report: Definition of onboard processing requirements
[NASA-CR-151108] N77-12120
SPACE-TIME FUNCTIONS
Space-time trade-offs in structured programming
[AD-A025599] N77-12748
SPACECRAFT ANTENNAS
Evaluation of selected space shuttle orbiter antenna systems
N77-12238

SPACECRAFT COMMUNICATION
The role of coding in multiple-access satellite communication systems
[AD-A025612] N77-12116
Mobile terminal access to the advanced command-control architectural testbed
[AD-A025818] N77-12281
Report from space
[NASA-TT-F-17504] N77-12482
SPACECRAFT COMPONENTS
Preliminary vibration, acoustic, and shock design and test criteria for components on the SRB, ET, and SSME
[NASA-TM-X-64868] N77-12114
SPACECRAFT CONFIGURATIONS
Effect of specific configuration changes on the aerodynamics of the MSC-040-A orbiter at transonic speeds
[ESA-TT-332] N77-12002
SPACECRAFT DESIGN
Orbiter description document for Jupiter Orbiter Probe 1981/1982 Mission
[NASA-CR-149244] N77-12097
SPACECRAFT MANEUVERS
Approximating functions for earth atmospheric density
[NASA-TT-F-17107] N77-12608
SPACECRAFT MODULES
Development of a self contained heat rejection module, phase 2 and 3
[NASA-CR-151109] N77-12068
SPACECRAFT MOTION
Determining the motion of space vehicles
[NASA-TT-F-17100] N77-12118
SPACECRAFT PERFORMANCE
Report on one year's flight: INTASAT satellite project
[NASA-TT-F-16739] N77-12095
SPACECRAFT STABILITY
Passive attitude stabilization of satellites — magnetic and gravity gradient methods
[VTH-176] N77-12100
SPACECRAFT TRACKING
Effect of sun angle, atmospheric attenuation, and turbulence on mirror beacons for LANDSAT image control
[PB-255404/6] N77-12488
SPARE PARTS
A replacement policy for components of a pure series system utilizing one component as an indicator of replacement time
[AD-A024979] N77-12825
SPECIFIC HEAT
Specific heat of dilute transition alloys
[ESA-TT-353] N77-12187
SPECIFICATIONS
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091
SPECKLE PATTERNS
Speckle pattern correlation method for measurement of surface structural changes caused by fatigue
N77-12433
SPECTRAL CORRELATION
A comparison of practical and theoretical correction factors for use in X-ray fluorescence analysis of oxide materials
[PB-256054/8] N77-12165
SPECTRAL ENERGY DISTRIBUTION
Measurement of optical power radiated by Florida lightning
[AD-A025320] N77-12621
SPECTROMETERS
Field spectrometer [S191H] preprocessor tape quality test program design document
[NASA-CR-151110] N77-12364
Electron impact excitation of molecular nitrogen: High energy-resolution studies of electron impact optical excitation functions of the first positive system
N77-12885
SPECTROPHOTOMETRY
The determination of trace amounts of aluminium, bismuth, chromium and antimony in steels by flameless atomic absorption spectrophotometry
[PB-256053/0] N77-12204
Investigation of the absorption coefficients of Ge and MgF2 in the ultraviolet, visible, and near-infrared spectrum ranges in the 300 - 800 K band
N77-12856
SPECTROSCOPIC ANALYSIS
Applicability of spectrometric oil analysis to internal combustion engines: Initial phase of extended life test
[AD-A024743] N77-12168
SPECTRUM ANALYSIS
Spectral estimation with reduction of processed data
[R-2-75] N77-12818
SPECULAR REFLECTION
Low reflectivity solar cells
[AD-A025922] N77-12539
SPEECH
Time Delay Estimation
[AD-A025620] N77-12834
SPEECH RECOGNITION
Development of a speech amplifier system for use with the Navy A4 oxygen breathing apparatus and a proposed firefighting instructor's breathing device
[AD-A025184] N77-12321
SPHERES
Experimental and theoretical analysis of transonic flow around a sphere
N77-11987
Mutual coupling in spherical arrays of circular waveguide elements
N77-12290
Methods for solving the viscoelasticity equations for cylinder and sphere problems
[AD-A025302] N77-12800
SPHERICAL SHELLS
SPHERE, a program for computing buckling loads of spherical shells under uniform pressure
[AD-A025012] N77-12467
SPHERICAL WAVES
Theory of thin screen scintillations for a spherical wave
[NASA-TM-X-71225] N77-12857
SPIN
Stability analysis of extended gyrostats
N77-12829
SPIN REDUCTION
Thermal vacuum qualification tests on a Dornier medium speed despin mechanism
[ESA-ESTL-20] N77-12409
SPIN RESONANCE
Surface effects on spinwave resonance in thin magnetic films
N77-12884
SPINAL CORD
The response to sound of identified reticulo-spinal cells
N77-12677
SPLINE FUNCTIONS
The numerical solution of the eigenvalue problem for integral operators using the method of projections
N77-12781
Nonlinear spline method for optimal thrust vector control atmospheric interceptor guidance
N77-12789
Applications of generalized spline functions to empirical Bayes estimation
N77-12814
SPOILERS
Low-speed wind-tunnel investigation of flight spoilers as trailing-vortex-alleviation devices on a medium range wide-body tri-jet airplane model
[NASA-TN-D-8360] N77-11968
SPORADIC E LAYER
Analysis of occurrence of sporadic E and accuracy of predictions of sporadic-E critical frequencies for Temperate Latitude Northern Hemisphere Stations
[PB-255875/7] N77-12268
World maps of sporadic E [foEs greater than 7 MHz] for use in prediction of VHF oblique-incidence propagation
[PB-255904/5] N77-12269
SPUTTERING
Sputtering
[NASA-TM-X-73527] N77-12236
Multitarget sputtering using decoupled plasmas
[AD-A025609] N77-12895
SQUARE WAVES
An economical square-wave polarograph for electrochemical analysis
N77-12149
STABILITY DERIVATIVES
FORTRAN programs for the determination of aerodynamic derivatives from transient longitudinal or lateral responses of aircraft
[ARC-CP-1344] N77-12067
STABILIZATION
Development of a prototype experimental plan to evaluate stabilized optical viewing devices. 2: Inflight measures of airsickness potential
[AD-A025455] N77-12704
In-flight evaluation of hand-held optically stabilized target acquisition devices
N77-12717
STAINLESS STEELS
Progress report on the corrosion behavior of selected stainless steels in soil environments
[PB-256329/4] N77-12202
STANDARDS
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430
Precision standing comparison between remotely separated time standards
[BLL-DRIC-TRANS-4307-[3623.66]]
N77-12830
STAR DISTRIBUTION
Spectrophotometry of cool stars in the near infrared. Part 3: Results for a region in the direction of l 2 = 138 deg
[ISBN-0-902553-13-5] N77-12957
STATIC LOADS
Measurement of the static influence coefficient of the AH-1G Cobra fuselage
[AD-A025114] N77-12044
STATISTICAL ANALYSIS
A procedure for the statistical analysis of vehicular noise emission spectra for limited samples
[AD-A025981] N77-12602
A comparison of several attribute sampling plans
[AD-A025700] N77-12821
Statistical indicators of scientific and technical communication [1960-1980]. Volume 3: A data appendix to volume 2
[PB-255503/5] N77-12927
STATISTICAL DISTRIBUTIONS
A guide to the Burr Type XII distributions
[AD-A025242] N77-12803
STATISTICAL TESTS
Two related goodness-of-fit problems with applications to spacings
[AD-A025699] N77-12808
STEADY FLOW
Display and calculation of flow past wings in supersonic flight
[ESA-TT-333] N77-12003
STEAM TURBINES
Through-flow calculation procedures for application to high speed large turbines
N77-12020
STEELS
Ship steel weldments for low temperature service
[PB-256997/8] N77-12203
The determination of trace amounts of aluminium, bismuth, chromium and antimony in steels by flameless atomic absorption spectrophotometry
[PB-256053/0] N77-12204
Determination of correction factors by regression analysis for the analysis of sulfur using optical emission spectrometry
[PB-256052/2] N77-12205
Variation of mechanical properties in large steel forgings
[AD-A025807] N77-12208
Simplifier cut core inductor design
[NASA-CR-149241] N77-12292
The welding of organic coated steels and laminates
[PB-256056/3] N77-12416
Outdoor evaluation: Study means of assuring MIL-D-6054 steel drums are hermetically sealed
[AD-A025809] N77-12418
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585
STELLAR EVOLUTION
The properties of the early sun
N77-12983
STELLAR SPECTROPHOTOMETRY
Spectrophotometry of cool stars in the near infrared. Part 3: Results for a region in the direction of l 2 = 138 deg
[ISBN-0-902553-13-5] N77-12957
STEREOCHEMISTRY
The diastereosequence distribution resulting from a two-state mechanism involving first order Markovian addition steps
N77-12129
STEREOPHOTOGRAPHY
A new photogrammetric comparator design
[AD-A025977] N77-12503
STIRLING CYCLE
Optimum compression ratios of Stirling cycle machines
[REPT-68] N77-12405
STOCHASTIC PROCESSES
Results of some investigations of differential gain theory applied to air-to-air systems. Volume 2: Stochastic differential games with complexity constrained strategies for air-to-air systems
[AD-A025322] N77-12008
Control for large scale and uncertain systems
[AD-A025819] N77-12779
Stochastic approximation with correlated data
[AD-A024279] N77-12819
Estimation of parameters of zero-one processes by interval sampling
[AD-A025698] N77-12823
STOICHIOMETRY
Laser pyrolysis gas chromatography and plasma stoichiometric analysis
N77-12145
STOPPING POWER
Inverse mean free path, stopping power, CSDA range, and straggling in silicon and silicon dioxide for electrons of energy less than or equal to 10 keV
[AD-A025488] N77-12902
STORABLE PROPELLANTS
The feasibility of a storable propellant turbine/high-speed alternator as a compact short-life power system for hardened ballistic missile defense [BMD] installations
[AD-A024786] N77-12543
STORAGE BATTERIES
Solid electrolyte battery materials
[AD-A024658] N77-12542
STORAGE STABILITY
On-orbit and in-plant satellite storage
[AD-A025902] N77-12105

STORAGE TANKS
Investigate feasibility of utilizing acoustic emission methods to evaluate the integrity of a prototype ADAPTS oil storage container
[AD-A025910] N77-12425
Temperature distribution of a hot water storage tank in a simulated solar heating and cooling system
[NASA-TM-X-73549] N77-12521
STRAIN GAGES
Bonding of elevated temperature strain gages to humid aged graphite tensile specimens through the use of anaerobic adhesives
[AD-A025920] N77-12223
STRAPDOWN INERTIAL GUIDANCE
Micro navigator [MICRON] phase 2A. Volume 2: Technical report
[AD-A021526] N77-12033
Simulation models and baseline guidance and control for indirect-fire missiles with strapdown-inertial guidance
[AD-A024977] N77-12102
STRATOSPHERE
Measurement of gaseous minor constituents in the natural stratosphere --- to predict stratospheric pollution by supersonic aircraft flight
[ESA-TT-337] N77-12615
Chemistry in the stratosphere
[PB-255862/5] N77-12633
STRESS (PHYSIOLOGY)
Motion sickness incidence: Exploratory studies of habituation, pitch and roll, and the refinement of a mathematical model
[AD-A024709] N77-12689
STRESS CONCENTRATION
On the dynamic stress concentration of notched plates as induced by tensile stress waves, volume 41, no. 4
[ISAS-540] N77-12434
Stress intensity factors for three-dimensional problems
[AD-A025802] N77-12460
An analytical model for uniaxial cyclic inelastic behavior of reinforced concrete
[AD-A024910] N77-12465
STRESS CORROSION
Effects of iron and silicon content on stress corrosion cracking in a thermomechanically processed aluminum alloy
[AD-A025165] N77-12210
STRESS CORROSION CRACKING
Investigation of stress corrosion of Inconel 600 and Incoloy 800 for steam generators
[BLL-RISLEY-TR-3038-[9091.9F]] N77-12177
Investigation of the stress corrosion cracking susceptibility of the alloy AlZnMgCu 1.5 with regard to electrochemical and metallurgical aspects
[ESA-TT-336] N77-12186
STRESS MEASUREMENT
Optical studies of the stress-induced crystallization of rubbers N77-12215
STRESS PROPAGATION
Prestress tendons on short radius curves
[PB-256015/9] N77-12458
STRESS WAVES
On the dynamic stress concentration of notched plates as induced by tensile stress waves, volume 41, no. 4
[ISAS-540] N77-12434
STRIP MINING
Development of a multi-disciplinary ERTS user program in the state of Ohio
[E77-10045] N77-12475
An application of ERTS technology to the evaluation of coal strip mining and reclamation in the northern Great Plains
[NASA-CR-149208] N77-12486
STRIP TRANSMISSION LINES
A preliminary report on the in-house exploratory development program on microstrip patch antennas at the Naval Surface Weapons Center
[AD-A025304] N77-12256
Analysis of strip line dispersion N77-12298
STRUCTURAL ANALYSIS
Boron-epoxy-reinforced titanium aircraft landing-gear drag strut
[NASA-TN-D-8289] N77-12218
Structural analyses for the modification and verification of the Viking aeroshell
[NASA-TN-D-8300] N77-12436
STRUCTURAL DESIGN
General operations program Signe 3
[NASA-TT-F-16760] N77-12096
STRUCTURAL DESIGN CRITERIA
Application of building climatology to the problems of housing and building for human settlements
[WMO-441] N77-12640
Statistical concepts in design
[AD-A025750] N77-12699
STRUCTURAL FAILURE
Preliminary evaluation of fatigue life gages used for beam life prediction
[AD-A024811] N77-12375
STRUCTURAL STRAIN
Preliminary evaluation of fatigue life gages used for beam life prediction
[AD-A024811] N77-12375
History of earthquakes in Colombia N77-12607
STRUCTURAL VIBRATION
A study of servo accelerometer design for low frequency vibration measurement --- of large structures
[ISVR-TR-85] N77-12369
STRUCTURES
Blast pressures inside and outside suppressive structures
[AD-A025504] N77-12447
Methods of predicting blast loads inside and outside suppressive structures
[AD-A024906] N77-12466
SUBMARINES
Development of a superconducting ELF receiving antenna
[AD-A024666] N77-12319
SUBROUTINES
A visual display system for the HP 2100A computer
[R-1-76] N77-12723
SUBSONIC WIND TUNNELS
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
SUDDEN IONOSPHERIC DISTURBANCES
Satellite beacon data reduction and analysis
[AD-A025329] N77-12617
SULFATES
Measurement of atmospheric sulfates: Literature search and methods selection
[PB-254387/4] N77-12562
SULFONATES
Ion binding studies of polysulfonates N77-12840
SULFUR
Determination of correction factors by regression analysis for the analysis of sulfur using optical emission spectrometry
[PB-256052/2] N77-12205
A laboratory evaluation of sulphur-asphalt paving mixtures
[PB-254911/1] N77-12441
SULFUR COMPOUNDS
Experimental and theoretical investigation of the thermodynamic properties of sulfur hexafluoride in the liquid phase
[AD-A024986] N77-12919
SULFUR DIOXIDES
Mechanism of photochemically initiated oxidations
[PB-256397/1] N77-12575
Evaluation of SO2 emission control technology applicable to the East Helena lead smelter
[PB-255277/6] N77-12580
SULFUR OXIDES
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
SUN
The properties of the early sun N77-12983
SUNLIGHT
Sunlight and the ocean
[AD-A024678] N77-12665
SUPERCONDUCTIVITY
Superconductivity: A changing R and D scene in Germany
[AD-A025445] N77-12906
SUPERCONDUCTORS
Low-gravity processing of superconducting compounds
[NASA-CR-150106] N77-12183
Development of a superconducting ELF receiving antenna
[AD-A024666] N77-12319
SUPERHIGH FREQUENCIES
Analysis of strip line dispersion N77-12298
SUPERNOVA REMNANTS
Search of invisible supernovae --- due to interstellar extinction using IR telescopes
[D-236] N77-12956
SUPERNOVAE
Search of invisible supernovae --- due to interstellar extinction using IR telescopes
[D-236] N77-12956
SUPERSONIC AIRCRAFT
Supersonic aircraft after body study of a thick boundary layer on a two-dimensional step
[LRBA-E-815-PV-4/SAE] N77-12001
SUPERSONIC COMBUSTION RAMJET ENGINES
Scramjet nozzle design and analysis as applied to a highly integrated hypersonic research airplane
[NASA-TN-D-8334] N77-11994
SUPERSONIC COMPRESSORS
Through-flow calculation procedures for application to high speed large turbines N77-12020
SUPERSONIC DIFFUSERS
A study of boundary layer and mass bleed in a short length supersonic diffuser for a gas dynamic laser
[AD-A025673] N77-12394
SUPERSONIC FLIGHT
Measurement of gaseous minor constituents in the natural stratosphere --- to predict stratospheric pollution by supersonic aircraft flight
[ESA-TT-337] N77-12615
SUPERSONIC FLOW
Display and calculation of flow past wings in supersonic flight
[ESA-TT-333] N77-12003
Aerodynamic coefficients and position of the bow shock wave of circular cones with pointed and spherically blunted noses in supersonic flow
[ESA-TT-335] N77-12005
An experimental investigation of the Whistler nozzle and an analytical investigation of a ring wing in supersonic flow
[AD-A025672] N77-12009
User's manual: Supersonic unsteady cascade program, volume 2
[AD-A025186] N77-12012
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 1
[NASA-CR-147646] N77-12109
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 2
[NASA-CR-147647] N77-12110
Analysis of supersonic unsteady cascades with the method of characteristics, volume 1
[AD-A025909] N77-12342
SUPERSONIC JET FLOW
On the computation of strongly underexpanded supersonic submerged jets N77-12343
SUPERSONIC NOZZLES
Secondary gas injection into a supersonic conical nozzle --- induced flow distribution N77-12336
Unsteady transonic flow with heat addition due to condensation
[AD-A025651] N77-12350
SUPERSONIC TRANSPORTS
Low-speed wind-tunnel investigation of a large scale advanced arrow-wing supersonic transport configuration with engines mounted above wing for upper-surface blowing
[NASA-TN-D-8350] N77-11997
Effects of upper-surface blowing and thrust vectoring on low speed aerodynamic characteristics of a large-scale supersonic transport model
[NASA-TN-D-8296] N77-12065
SUPERSONIC WIND TUNNELS
Application of computed shock standoff distances for windtunnel calibration at supersonic Mach numbers less than 1.2 --- using Schlieren photography N77-11980
Experiments and analysis related to external burning for propulsion
[AD-A024984] N77-12128
SURFACE FINISHING
Surface characterization of titanium and titanium alloy. Part 1: Effect on titanium-6 aluminum-4 vanadium alloy of commercial treatments
[AD-A025334] N77-12188
Study of surface finishing and coating of DF laser windows
[AD-A025710] N77-12396
SURFACE LAYERS
Investigation of the stress corrosion cracking susceptibility of the alloy AlZnMgCu 1.5 with regard to electrochemical and metallurgical aspects
[ESA-TT-336] N77-12186
Surface effects on spinwave resonance in thin magnetic films N77-12884
Effectiveness of heat-emitting coatings with variable degree of blackness N77-12893
SURFACE NAVIGATION
Terrestrial radiodetermination potential users and their requirements
[PB-255839/3] N77-12035
SURFACE PROPERTIES
Surface analysis of 6061 and 7050 aluminum alloys after conditioning by chemical treatment
[AD-A025736] N77-12200
Radiational heat exchange between surfaces with anisotropic radiation
[NLL-M-25350-[5828.4F]] N77-12328
Speckle pattern correlation method for measurement of surface structural changes caused by fatigue N77-12433
Scanning electron microscopy, ion scattering and secondary ion mass spectrometry to characterize apparent adhesive failure in an adhesive bond
[AD-A025615] N77-12442

Pavement surface dynamics friction measurement and analysis in Kansas
[PB-255490/5] N77-12459

SURFACE REACTIONS
Investigations of column packing materials for gas solid chromatography
N77-12147
Investigations of surfaces and interfaces using optical excitation of surface plasmons
[AD-A025285] N77-12162

SURFACE ROUGHNESS EFFECTS
Analysis of dynamic aircraft response to bomb damage repair
[AD-A025647] N77-12047
Solar cell observables reduction techniques
[AD-A025923] N77-12541

SURFACE STABILITY
Transonic stability and control characteristics of a 0.015 scale model 69-0 of the space shuttle orbiter with forebody RSI modification in the NASA/LaRC 8 foot TPT [LA72]
[NASA-CR-147644] N77-12108

SURFACE TO AIR MISSILES
SAM-D trade-off study, Electromechanical Control Actuation System [em/CAS]
[AD-A025232] N77-12104

SURFACE TO SURFACE MISSILES
Minuteman stage 3 component report
[AD-A025093] N77-12103

SURGES
Transients in low voltage power system: Descriptions of transients observed in the area of Copenhagen in some industries, hospitals, offices, laboratories, etc.
[ECR-63] N77-12294
Transient currents in partially shielded conductors: A circuit model
[AD-A025135] N77-12324

SURVEILLANCE RADAR
Colloquium on Solid State Transmitters for Radar
[AD-A025189] N77-12255

SURVEYS
A survey of fracture mechanics applications in the United States
[AD-A024715] N77-12463

SWAGING
Consolidation of Beta 3 titanium alloy spherical metal powders by hot swaging
[AD-A025469] N77-12196

SWEDEN
Urban and regional research in Sweden 1974-1975. An annotated list
[PB-256201/5] N77-12949

SWINGBY TECHNIQUE
Solar out-of-ecliptic study. Volume 1: Executive summary --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-1] N77-12087
Solar out-of-ecliptic study. Volume 2: System analysis and definition --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-3] N77-12089
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091

SWITCHING CIRCUITS
An integrated system approach for automatic switching radio telephony
[AD-A024889] N77-12265
Advanced power processing techniques for DC to DC converters
[AD-A025915] N77-12306

SYMBOLIC PROGRAMMING
Mask pattern generation techniques --- in computer programming
N77-12745
Applied mathematics
[AD-A025791] N77-12807

SYNCHRONISM
TCP resynchronization
[AD-A024822] N77-12262
Precision standing comparison between remotely separated time standards
[BLL-DRIC-TRANS-4307-[3623.66]]
N77-12830

SYNCHRONIZERS
A VHF transmitter and system synchronizer for use in a portable Doppler radar system
[PB-256094/4] N77-12270

SYNCHRONOUS SATELLITES
Systems and methods for determining radio frequency interference
[NASA-CASE-GSC-12150-1] N77-12247

SYNCHROTRONS
The Frascati [e, e'p] experimental apparatus
[ISS-P-75/3] N77-12072

SYNOPTIC METEOROLOGY
Yearbook A, no. 126: Meteorology, 1974
[KNMI-97-126] N77-12645
Synoptic thermal wind calculations from radiosonde observations over the southwestern United States
[AD-A025693] N77-12655

SYNTAX
FORESTER: A language for morphological analysis of hierarchical systems, with reference to structural exegesis of the synoptic traditions
N77-12740

SYNTHETIC FUELS
Impacts of synthetic liquid fuel development. Automotive market. Volume 1: Summary
[PB-255994/6] N77-12533
Impacts of synthetic liquid fuel development. Automotive market. Volume 2
[PB-255995/3] N77-12534
Preliminary economics and comment: In-situ gasification of coal for power and SNG
[PB-256034/0] N77-12554
A bioenvironmental study of emissions from refuse derived fuel
[AD-A024661] N77-12571

SYNTHETIC RUBBERS
Optical studies of the stress-induced crystallization of rubbers
N77-12215

SYSTEM 10 COMPUTER
Programmer's guide for REMAPP REMote Sensing Array Processing Procedures
[PB-256693/3] N77-12758

SYSTEMS ANALYSIS
Solar out-of-ecliptic study. Volume 2: System analysis and definition --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition --- Jupiter swingby scientific mission
[ESS/SS-699-VOL-3] N77-12089
Reduced order models for power system analysis
N77-12291
Planning models for the assessment of advanced energy storage systems
N77-12504
CHILD: A system for the development and didactic introduction to microprocessors
[R-4-76] N77-12768

SYSTEMS ENGINEERING
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
Development of a self contained heat rejection module, phase 2 and 3
[NASA-CR-151109] N77-12068
Preliminary vibration, acoustic, and shock design and test criteria for components on the SRB, ET, and SSME
[NASA-TM-X-64868] N77-12114
Final engineering report for Goldstone operations support radar
[NASA-CR-149239] N77-12244
Software modeling studies
[AD-A025895] N77-12749
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777

T

TABLES [DATA]
Turbines: Presentation of calculated data and comparison with experiments
N77-12026
Water resources data for New Jersey, water year, 1975
[PB-256802/0] N77-12496
Water resources data for Hawaii and other Pacific areas, water year 1975
[PB-256668/5] N77-12497
Vapor phase spectra for air pollution studies
[AD-A025156] N77-12603
Statistical indicators of scientific and technical communication [1960-1980]. Volume 3: A data appendix to volume 2
[PB-255503/5] N77-12927

TALC
Analysis and characterization of high purity talc for use in propellants; determination of talc in propellants
[AD-A025122] N77-12234

TANKER SHIPS
Ship steel weldments for low temperature service
[PB-256997/8] N77-12203

TANTALUM
Investigate fiber reinforced Si13N4
[AD-A025901] N77-12137

TANTALUM COMPOUNDS
Charge transport and the photorefractive effect in doped and undoped lithium tantalate
N77-12358

TARGET ACQUISITION
Multiple Target Instrumentation Radar [MTIR] study, phase 2, add-on
[AD-A025939] N77-12272
In-flight evaluation of hand-held optically stabilized target acquisition devices
N77-12717

TARGET RECOGNITION
Parametric analysis of laser target designators for airborne applications
[AD-A025639] N77-12397

TAXIING
Analysis of dynamic aircraft response to bomb damage repair
[AD-A025647] N77-12047

TECHNICAL WRITING
Statistical indicators of scientific and technical communication [1960-1980]. Volume 3: A data appendix to volume 2
[PB-255503/5] N77-12927

TECHNOLOGIES
Some results of studies in space technology in the USSR --- trends towards material behavior and operations in space
[D-240] N77-12085

TECHNOLOGY ASSESSMENT
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
Preliminary evaluation of fatigue life gages used for beam life prediction
[AD-A024811] N77-12375
Development of 20 percent efficient solar cell
[PB-255903/7] N77-12548
Assessment of cadmium sulfide photovoltaic arrays for large scale electric utility applications
[PB-255646/2] N77-12551
USAF aviator classes. HGU-4/P: History and present state of development
N77-12712

TECHNOLOGY TRANSFER
Statistical indicators of scientific and technical communication [1960-1980]. Volume 3: A data appendix to volume 2
[PB-255503/5] N77-12927
Scientific and technical information needs of users or potential users of the DSA-administered, DoD Information Analysis Centers
[AD-A024937] N77-12928
Biomedical technical transfer. Applications of NASA science and technology
[NASA-CR-149161] N77-12935
An overview of Federal technology transfer
[PB-255693/4] N77-12953

TECHNOLOGY UTILIZATION
Multiplexing techniques for advanced surface craft
[X76-979/301] N77-12245
Coating science and technology --- laser optical films
[AD-A025487] N77-12411
Quarterly literature review of the remote sensing of natural resources, third quarter 1976 --- bibliography
[NASA-CR-149163] N77-12470
SEASAT: A candidate ocean industry economic verification experiments
[NASA-CR-149228] N77-12476
USA report proposes: An end to free satellite pictures
[NASA-TT-F-16732] N77-12479
Thin film solar cells for terrestrial applications
[PB-255606/6] N77-12553
Nonpropulsive applications of ion beams
[NASA-TM-X-73511] N77-12847
Telecommunications and society, 1976-1991: Report to office of telecommunications policy executive Office of the President
[PB-256829/3] N77-12942

TELECOMMUNICATION
Receiving and tracking phase modulated signals
[NASA-CASE-MSC-16170-1] N77-12248
University College London ARPANET project
[AD-A025293] N77-12253
Performance measurements over long line-of-sight microwave links in Colorado
[PB-256261/9] N77-12266
Low cost data and text communication for the less developed countries: A study with special reference to the needs of the international agricultural research centers
[PB-256067/0] N77-12271
An overview discussion of propagation effects of nuclear environments on VLF-LF communication systems
[AD-A024956] N77-12286
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 1: Text
[PB-256822/8] N77-12729
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 2: Appendixes
[PB-256823/6] N77-12730
Telecommunications and society, 1976-1991: Report to office of telecommunications policy executive Office of the President
[PB-256829/3] N77-12942

TELEVISION TRANSMISSION
A follow-on study on crossed-field amplifiers for TVBS mission --- television broadcasting satellite
[HR1084] N77-12251

TELLURIUM COMPOUNDS
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
TEMPERATURE CONTROL
Development of sputtered high temperature coatings for thrust chambers
[NASA-CR-135097] N77-12181
TEMPERATURE EFFECTS
Evaluation of temperature effects on bituminous pavement deflections in Virginia
[PB-255955/7] N77-12456
Temperature effects of crude oil in the upper intertidal zone
[PB-255956/5] N77-12581
Some aspects of the influence of abnormal eastern equatorial Pacific Ocean surface temperatures upon weather patterns in the southwestern United States, volume 2
[AD-A024710] N77-12651
TEMPERATURE MEASUREMENT
High emissivity coatings for IR-temperature measurements
[ECN-15] N77-12366
TEMPERATURE MEASURING INSTRUMENTS
Dissolved oxygen meter, model 57 [Yellow Springs Instrument Co., Inc., Ohio]
[PB-256754/3] N77-12378
TEMPERATURE PROFILES
Turbulent flux estimates from shipboard mean wind and temperature profiles and dissipation rates
[AD-A025438] N77-12650
TENDONS
Prestress tendons on short radius curves
[PB-256015/9] N77-12458
TENSILE STRESS
Effect of self-locking nuts on torque-tension relationship
[AD-A024893] N77-12417
On the dynamic stress concentration of notched plates as induced by tensile stress waves, volume 41, no. 4
[ISAS-540] N77-12434
Growth of part-through cracks in simple construction elements
[IFKM-76/1] N77-12439
TENSILE TESTS
A tensile testing experiment correlating load with acoustic emission
[AD-A024813] N77-12450
TERMINAL BALLISTICS
A study of the crack damage in fuel-filled tank walls due to ballistic penetrators
[AD-A025430] N77-12449
TERMINAL GUIDANCE
Investigation of the use of an electronic multifunction display and an electromechanical horizontal situation indicator for guidance and control of powered-lift short-haul aircraft
[NASA-CR-137922] N77-12055
Nonlinear spline method for optimal thrust vector control atmospheric interceptor guidance
N77-12789
TERRESTRIAL RADIATION
The radiation and energy budgets of the earth using both ground-based and satellite-derived values of total cloud cover
[PB-256756/8] N77-12632
TEST CHAMBERS
Study of factors affecting reactions in environmental chambers
[PB-256252/8] N77-12167
TEST EQUIPMENT
Development and application of a low cost gas dynamic laser test facility
[AD-A025648] N77-12074
Mobile terminal access to the advanced command-control architectural testbed
[AD-A025818] N77-12281
An analytical and experimental determination of the cutoff frequencies of higher-order TE modes in a TEM cell
[PB-256319/5] N77-12376
Instrumentation and equipment for testing highway materials, products, and performance
[PB-256138/9] N77-12377
Investigation and evaluation of a Zero Input Tracking Analyzer [ZITA]
[AD-A025431] N77-12700
TEST FACILITIES
Development and application of a low cost gas dynamic laser test facility
[AD-A025648] N77-12074
Exploding wire shock test facility
[AD-A024924] N77-12079
TEST PILOTS
Entrance of mankind into space [15th anniversary of the first manned flight into space]
[NASA-TT-F-17114] N77-12082
TETHERED BALLOONS
Lightning strike warnings for tethered balloon operations
[AD-A025486] N77-12649
TEXAS
Our natural resources: What is our water worth. 1975 - 1978 water quality management planning program, North Central Texas Council of Governments
[PB-256976/2] N77-12947
THEOREM PROVING
Reasoning from incomplete knowledge in a procedural deduction system
[AD-A024971] N77-12750
Asymptotic properties of solutions of the equation y' = f[x]phi[y]
N77-12791
Invariant measures and its applications
N77-12792
THEORIES
Contribution to Frenkel condensation theory
N77-12899
THERMAL BLOOMING
Multidither adaptive algorithms
[AD-A025185] N77-12765
THERMAL CONDUCTIVITY
The thermal conductivity of metal-power/epoxy-resin composites
[AD-A024963] N77-12143
THERMAL DIFFUSION
Analyses of ACPL thermal/fluid conditioning system
[NASA-CR-149166] N77-12333
THERMAL EMISSION
Effectiveness of heat-emitting coatings with variable degree of blackness
N77-12893
THERMAL ENERGY
Conference proceedings, Energy from the Oceans, Fact or Fantasy
[PB-256093/6] N77-12547
Maritime and construction aspects of Ocean Thermal Energy Conversion [OTEC] plant ships
[PB-255639/7] N77-12552
THERMAL ENVIRONMENTS
Thermal-environment testing of a 30-cm engineering model thruster
[NASA-TM-X-73522] N77-12121
THERMAL FATIGUE
Weathering and weatherability of rocks: Experiments on thermal fatigue of non-igneous rocks
[AD-A025598] N77-12619
THERMAL INSULATION
Evaluation of insulation materials for advanced motor systems
[AD-A025306] N77-12124
THERMAL POLLUTION
Physical and biological aspects of thermal pollution in sea water — forecasting electric power production in Italy
[ISS-L-75/14] N77-12560
Assessment of the impact of proposed thermal effluent guidelines for the steam electric power industry
[PB-255937/5] N77-12587
THERMAL PROTECTION
Effectiveness of four water cooled undergarments and a water cooled cap in reducing heat stress
[AD-A025216] N77-12696
THERMAL RADIATION
DFVLR/AEDC cooperative thermal vacuum test 3
[AD-A024778] N77-12237
THERMAL VACUUM TESTS
Thermal vacuum qualification tests on a Dornier medium speed despin mechanism
[ESA-ESTL-20] N77-12409
THERMOCHEMICAL PROPERTIES
Effectiveness of heat-emitting coatings with variable degree of blackness
N77-12893
Equations of state and impact-induced shock-wave attenuation on the moon
[NASA-CR-149245] N77-12987
THERMOCHEMISTRY
Thermochemistry of gaseous metal oxides
[AD-A025661] N77-12164
THERMODYNAMIC PROPERTIES
Thermodynamic, structural and transport properties of some fluorite solid electrolytes
N77-12892
Equilibrium compositions and compressibility factors for air in the temperature range 1500 to 13000 Kelvin and for densities from 0.000001 to 1000 times standard density
[AD-A025449] N77-12916
Experimental and theoretical investigation of the thermodynamic properties of sulfur hexafluoride in the liquid phase
[AD-A024986] N77-12919
THERMODYNAMICS
Thermomechanics of fiber-reinforced composites
[AD-A024948] N77-12140
Optimum compression ratios of Stirling cycle machines
[REPT-68] N77-12405
On thermodynamics and the nature of the second law. 1: Single phase continua
[AD-A025109] N77-12915
THERMOGRAVIMETRY
Oxygen potential of uranium-plutonium oxide as determined by controlled-atmosphere thermogravimetry
N77-12152
THERMOHYDRAULICS
Effectiveness of four water cooled undergarments and a water cooled cap in reducing heat stress
[AD-A025216] N77-12696
THERMOPHYSICAL PROPERTIES
Thermal energy storage material thermophysical property measurement and heat transfer impact
[NASA-CR-135098] N77-12510
THERMOPLASTIC RESINS
Thermoplastic modulator brassboard
[AD-A025450] N77-12317
THICK FILMS
Thick and thinfilm inductors: An investigation of design and manufacturing parameters for VHF and UHF inductors made in film techniques
[ECR-64] N77-12296
THICK WALLS
Growth of part-through cracks in simple construction elements
[IFKM-76/1] N77-12439
THIN FILMS
Evaporation and surface energy of a metal deposited in a discontinuous thin film
N77-12179
Sputtering
[NASA-TM-X-73527] N77-12236
Thick and thinfilm inductors: An investigation of design and manufacturing parameters for VHF and UHF inductors made in film techniques
[ECR-64] N77-12296
Ternary compound thin film solar cells
[PB-256254/4] N77-12546
High-efficiency thin-film GaAs solar cells
[PB-255821/1] N77-12550
Thin film solar cells for terrestrial applications
[PB-255606/6] N77-12553
Absorptance calculations for a multilayer absorbing stack: Application to thin film photoconductor assemblies
[AD-A025798] N77-12868
The development of thin film photodetectors for the 8-14 micrometer atmospheric window
[AD-A025984] N77-12872
Surface effects on spinwave resonance in thin magnetic films
N77-12884
Heterogeneous nucleation and its influence on the structure of thin films
N77-12898
THREE DIMENSIONAL COMPOSITES
Stress intensity factors for three-dimensional problems
[AD-A025802] N77-12460
THREE DIMENSIONAL FLOW
Numerical simulation of three dimensional transonic flow including wind tunnel wall effects
N77-11984
Picking up and graphing of three dimensional flow fields
N77-11986
Three-dimensional flow calculation for a transonic compressor rotor
N77-12019
THRESHOLD DETECTORS [DOSIMETERS]
A detector test for low background measurement
[ISS-T-75/11] N77-12991
THRESHOLDS [PERCEPTION]
Photographic emulsion threshold functions study
[AD-A025471] N77-12374
THRUST AUGMENTATION
An experimental investigation of the Whistler nozzle and an analytical investigation of a ring wing in supersonic flow
[AD-A025672] N77-12009
THRUST CHAMBERS
Development of sputtered high temperature coatings for thrust chambers
[NASA-CR-135097] N77-12181
THRUST MEASUREMENT
Heat and thrust requirements of a thermal fog dispersal system
[AD-A025112] N77-12648
THRUST VECTOR CONTROL
Effects of upper-surface blowing and thrust vectoring on low speed aerodynamic characteristics of a large-scale supersonic transport model
[NASA-TN-D-8296] N77-12065
Nonlinear spline method for optimal thrust vector control atmospheric interceptor guidance
N77-12789
TIDES
Spin and tides
N77-12967
TIME DEPENDENCE
The importance of experimentally-determined closure conditions in transonic blade-to-blade flows calculated by a time-dependent technique
N77-11983

TIME DIVISION MULTIPLEXING
A comparison of distributed control and command/response multiplex systems
[AD-A025105] N77-12264
TIME LAG
Backlog and delay with wartime airlift
[AD-A025959] N77-12028
Time Delay Estimation
[AD-A025620] N77-12834
TIME MEASUREMENT
Precision standing comparison between remotely separated time standards
[BLL-DRIC-TRANS-4307-[3623.66]] N77-12830
TIME OPTIMAL CONTROL
Optimal scheduling of tasks on multiprocessor systems N77-12719
TIN
Hardening characteristics of TI-6AL-2SN-4ZR-6MO alloy
[AD-A025307] N77-12191
A Moessbauer study of Sn[2+]-doped europium monochalcogenides and a new look at the experimental foundations of spin-wave theory N77-12888
TIP DRIVEN ROTORS
Cold-air performance of a tip turbine designed to drive a lift fan. 1: Baseline performance
[NASA-TM-X-3452] N77-12000
TITANIUM
Surface characterization of titanium and titanium alloy. Part 1: Effect on titanium-6 aluminum-4 vanadium alloy of commercial treatments
[AD-A025334] N77-12188
TITANIUM ALLOYS
Surface characterization of titanium and titanium alloy. Part 1: Effect on titanium-6 aluminum-4 vanadium alloy of commercial treatments
[AD-A025334] N77-12188
Hardening characteristics of TI-6AL-2SN-4ZR-6MO alloy
[AD-A025307] N77-12191
Influence of subsurface defects on fatigue properties of titanium alloys
[AD-A025892] N77-12193
Fractographic evaluation of fracture specimens
[AD-A025746] N77-12194
The influence of heat treatment on the structure and properties of an isothermally forged Ti6-Al-6V-2Sn nose wheel and structural shape
[AD-A025473] N77-12195
Consolidation of Beta 3 titanium alloy spherical metal powders by hot swaging
[AD-A025469] N77-12196
Improvement of reliability and the mechanical properties of titanium alloy forgings
[AD-A025479] N77-12197
New approaches to titanium alloy microstructure-property characterization
[AD-A025734] N77-12199
TITANIUM COMPOUNDS
Preparation and magnetic properties of titanium phosphate glass N77-12213
TITRATION
Electrostatic calculations in membrane systems N77-12146
TOLLMEIN-SCHLICHTING WAVES
Flow-induced vibrations resulting from Karman vortex trails
[BLL-RISLEY-TR-2994-[9091.9F]] N77-11988
TOPOLOGY
Topology in biology, the relationship of structure to function N77-12666
TORQUE
Effect of self-locking nuts on torque-tension relationship
[AD-A024893] N77-12417
TORSIONAL VIBRATION
Determination of the torsional barriers around single bonds by vibrational spectroscopy N77-12153
TOWING
Development of a tow capability for the HH-3F helicopter
[AD-A025790] N77-12050
TOXIC HAZARDS
Toxic heavy metals in groundwater of a portion of the front range mineral belt
[PB-256212/2] N77-12582
TOXICITY
Ammonia toxicity
[PB-256447/4] N77-12577
TRACE CONTAMINANTS
Toxic heavy metals in groundwater of a portion of the front range mineral belt
[PB-256212/2] N77-12582
TRACE ELEMENTS
The determination of trace amounts of aluminium, bismuth, chromium and antimony in steels by flameless atomic absorption spectrophotometry
[PB-256053/0] N77-12204
TRADEOFFS
Space-time trade-offs in structured programming
[AD-A025599] N77-12748
TRAFFIC CONTROL
Implementation of proven technology in making the highway environment safe
[PB-256664] N77-12950
TRAILING-EDGE FLAPS
Low-speed wind-tunnel investigation of flight spoilers as trailing-vortex-alleviation devices on a medium range wide-body tri-jet airplane model
[NASA-TN-D-8360] N77-11968
Summary and evaluation of theoretical developments relating to trailing wing tip vortices generated by aircraft
[AD-A025614] N77-12007
TRAINING DEVICES
CHILD: A system for the development and didactic introduction to microprocessors
[R-4-76] N77-12768
TRAJECTORIES
Theoretical and experimental simulation methods for external store separation trajectories N77-11981
TRAJECTORY CONTROL
Generalization and refinement of an automatic landing system capable of curved trajectories
[NASA-TN-D-8336] N77-12032
TRAJECTORY OPTIMIZATION
Determining the motion of space vehicles
[NASA-TT-F-17100] N77-12118
TRANSFER FUNCTIONS
Analyses of ACPL thermal/fluid conditioning system
[NASA-CR-149166] N77-12333
TRANSFORMATIONS [MATHEMATICS]
Symbolic transformation groups N77-12827
TRANSFORMERS
Manufacturing methods and techniques for piezoelectric transformers
[AD-A025176] N77-12323
TRANSIENT RESPONSE
FORTRAN programs for the determination of aerodynamic derivatives from transient longitudinal or lateral responses of aircraft
[ARC-CP-1344] N77-12067
TRANSITION METALS
Magnetic resonance studies of paramagnetic transition metal complexes N77-12171
Unusual five-coordinate complexes of transition metal ions N77-12172
Distribution of electron density in a transitional metal impurity in dilute substitution solid solutions
[NLL-M-25348-[5828.4F]] N77-12173
Specific heat of dilute transition alloys
[ESA-TT-353] N77-12187
TRANSMISSION LINES
Nuclear electromagnetic pulse simulation by point source injection techniques for shielded penetrations
[AD-A024803] N77-12276
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 1: Multiconductor transmission line theory
[AD-A025028] N77-12304
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 2: Computation of the capacitance matrixes for ribbon cables
[AD-A025029] N77-12305
High-voltage transmission conductor motion research
[PB-255768/4] N77-12318
An analytical and experimental determination of the cutoff frequencies of higher-order TE modes in a TEM cell
[PB-256319/5] N77-12376
TRANSMISSIONS [MACHINE ELEMENTS]
High-survivable transmission system
[AD-A025930] N77-12046
TRANSMISSIVITY
An investigation of the degradation of a laser beam by high intensity turbulence
[AD-A025658] N77-12398
TRANSMITTER RECEIVERS
Equipment compliance report for AN/URC-78[XE-1]/V. Volume 4: Service condition test report
[AD-A025667] N77-12279
Coherent Optical Adaptive Techniques [COAT]
[AD-A025668] N77-12280
TRANSONIC COMPRESSORS
Three-dimensional flow calculation for a transonic compressor rotor N77-12019
TRANSONIC FLOW
The importance of experimentally-determined closure conditions in transonic blade-to-blade flows calculated by a time-dependent technique N77-11983
Numerical simulation of three dimensional transonic flow including wind tunnel wall effects N77-11984
Experimental and theoretical analysis of transonic flow around a sphere N77-11987
Calculation of transonic flows using an extended integral equation method
[NASA-TM-X-74227] N77-12335
Unsteady transonic flow with heat addition
[AD-A024737] N77-12340
Transonic two-dimensional flow analysis of compressor cascade with splitter vanes
[AD-A025921] N77-12347
Unsteady transonic flow with heat addition due to condensation
[AD-A025651] N77-12350
TRANSONIC SPEED
Effect of specific configuration changes on the aerodynamics of the MSC-040-A orbiter at transonic speeds
[ESA-TT-332] N77-12002
TRANSONIC WIND TUNNELS
Automatic control of a transonic wind tunnel with a real-time computer system N77-11977
Minimizing wall interference in connectional transonic test sections by using computer parametric studies N77-11978
Investigation of very low blockage ratio boattail models in the Langley 16-foot transonic tunnel
[NASA-TN-D-8335] N77-11998
Correlation of full-scale helicopter rotor performance in air with model-scale Freon data
[NASA-TN-D-8323] N77-11999
Advanced porous transonic wind-tunnel nozzles
[NASA-TM-X-73180] N77-12069
Design features and operational characteristics of the Langley 0.3-meter transonic cryogenic tunnel
[NASA-TN-D-8304] N77-12071
A mathematical model for the starting process
[AD-A025692] N77-12076
Transonic stability and control characteristics of a 0.015 scale model 69-0 of the space shuttle orbiter with forebody RSI modification in the NASA/LaRC 8 foot TPT [LA72]
[NASA-CR-147644] N77-12108
TRANSPARENCE
CPA color reversal study --- color film processing enhancement
[AD-A025899] N77-12373
Some examples of transparent potentials in the classical approximation
[PM/76/6] N77-12794
TRANSPONDERS
Assembling of the range partials into the range word in the ACMI system
[AD-A024770] N77-12287
TRANSPORT AIRCRAFT
Low-speed wind-tunnel investigation of flight spoilers as trailing-vortex-alleviation devices on a medium range wide-body tri-jet airplane model
[NASA-TN-D-8360] N77-11968
TRANSPORT PROPERTIES
Thermodynamic, structural and transport properties of some fluorite solid electrolytes N77-12892
TRAVELING WAVE TUBES
An 82 to 84 percent efficient, small size, 2 and 4 stage depressed collector for octave bandwidth high performance TWT's
[NASA-TM-X-73572] N77-12297
Millimeter dual helix traveling-wave tube
[AD-A025104] N77-12308
Intermodulation study --- in traveling wave tubes
[AD-A025689] N77-12315
Traveling-wave tube reliability estimates, life tests, and space flight experience
[NASA-TM-X-73541] N77-12423
Development of computer program TWTVA for calculation of 3-D electron trajectories in coupled-cavity TWTS
[AD-A025132] N77-12757
TRAYS
Automatic multiple-sample applicator and electrophoresis apparatus
[NASA-CASE-ARC-10991-1] N77-12157
TREES [MATHEMATICS]
FORESTER: A language for morphological analysis of hierarchical systems, with reference to structural exegesis of the synoptic traditions N77-12740
TREES [PLANTS]
Measurement of the motion of trees in two dimensions --- using manual and wind excitation
[ISVR-TR-86] N77-12437
Reconstruction of past climatic variability
[AD-A024276] N77-12647
TRENDS
Some results of studies in space technology in the USSR --- trends towards material behavior and operations in space
[D-240] N77-12085
TRIANGULATION
Triangular covariance factorizations for
[NASA-CR-149147] N77-12115

Chemical release triangulation and winds in the altitude range 93 km to 176 km
[AD-A024952] N77-12653
TROPICAL STORMS
Tropical cyclone initiation by the tropical upper tropospheric trough
[AD-A025456] N77-12656
TROPOSPHERE
Method of computing the influence of spherically laminar inhomogeneities on tropospheric refraction and contribution to the radio refraction of mists, cloudiness and rain
N77-12242
Tropical cyclone initiation by the tropical upper tropospheric trough
[AD-A025456] N77-12656
TUBE HEAT EXCHANGERS
Heat transfer and carryover of low pressure water in a heated vertical tube
[PB-256480/5] N77-12346
TUNNEL DIODES
Technology and physics of infrared and point contact diodes
[AD-A025330] N77-12896
TURBINE BLADES
A critical review of turbine flow calculation procedures
N77-12022
Summary of NASA aerodynamic and heat transfer studies in turbine vanes and blades
[NASA-TM-X-73518] N77-12059
TURBINES
Cold-air performance of a tip turbine designed to drive a lift fan. 1: Baseline performance
[NASA-TM-X-3452] N77-12000
Influence of air humidity on compressor and turbine efficiency determined from experimental data
[NASA-TT-F-17073] N77-12057
TURBOCOMPRESSORS
Through-flow calculations in axial turbomachinery
[AGARD-CP-195] N77-12013
Through-flow calculations based on matrix inversion: Loss prediction
N77-12016
Compressor design and experimental results
N77-12023
Comparison between the calculated and the experimental results of the compressor test cases
N77-12024
Turbine test cases: Presentation of design and experimental characteristics
N77-12025
TURBOGENERATORS
A device for detecting amplitudes of vibration of turbodynamo blades
[NLL-M-24095-[5828.4F]] N77-12360
The feasibility of a storable propellant turbine/high-speed alternator as a compact short-life power system for hardened ballistic missile defense [BMD] installations
[AD-A024786] N77-12543
TURBOJET ENGINES
Conceptual study of a low cost turbojet engine
[AD-A025652] N77-12062
TURBOMACHINE BLADES
The importance of experimentally-determined closure conditions in transonic blade-to-blade flows calculated by a time-dependent technique
N77-11983
TURBOMACHINERY
Through-flow calculations: Theory and practice in turbomachinery design
N77-12017
Finite element method for through-flow calculations
N77-12018
TURBULENCE EFFECTS
Distortion of weak shock and sound waves by atmospheric turbulence
[ESA-TT-355] N77-12616
TURBULENT DIFFUSION
Turbulent flux estimates from shipboard mean wind and temperature profiles and dissipation rates
[AD-A025438] N77-12650
TURBULENT FLOW
Experiments planned specifically for developing turbulence models in computations of flow fields around aerodynamic shapes
N77-11982
Similar solutions of the differential equations for mean velocities, turbulence energy and turbulence length
[ESA-TT-354] N77-12339
Flow visualization of the turbulent jet at the exit of a single element nozzle by holographic technique, and mean velocity profile measurements with a laser Doppler anemometer
[AD-A025439] N77-12348
Turbulent atmospheric flow over a backward-facing step
[NASA-CR-2749] N77-12639
Hydrodynamic separation of solids from solid-liquid mixtures
[PB-254490/6] N77-12938
TURBULENT WAKES
Mean flow and turbulence measurements in the wake of slender propeller-driven bodies including effects of pitch angle
[AD-A031088] N77-12337
TWO DIMENSIONAL FLOW
Atmospheric flow over two-dimensional bluff surface obstructions
[NASA-CR-2750] N77-11996
Transonic two-dimensional flow analysis of compressor cascade with splitter vanes
[AD-A025921] N77-12347
TWO DIMENSIONAL JETS
Jet impingement of a curved surface
N77-12334

U

U.S.S.R.
USSR Academy of Medical Sciences
[JPRS-68310] N77-12693
SOVRAD: A digest of recent Soviet R and D articles, volume 2, number 3, 1976
[AD-A025814] N77-12994
U.S.S.R. SPACE PROGRAM
Entrance of mankind into space [15th anniversary of the first manned flight into space]
[NASA-TT-F-17114] N77-12082
Some results of studies in space technology in the USSR --- trends towards material behavior and operations in space
[D-240] N77-12085
UH-1 HELICOPTER
In-flight far-field measurement of helicopter impulsive noise
[AD-A025979] N77-12060
Pilot opinion of flight displays and monitoring gauges in the UH-1 helicopter
[AD-A024714] N77-12579
ULTRAHIGH FREQUENCIES
Microstrips for UHF and microwaves: An evaluation of substrate materials and metallization technology for thin- and thickfilm microstrips
[ECN-19] N77-12295
Multimode phased array tube
[AD-A025691] N77-12316
ULTRAPURE METALS
Process for manufacture of stable highly pure metals which form gaseous hydrides, such as silicon or germanium, by means of electrical discharges
[NASA-TT-F-16763] N77-12180
ULTRAVIOLET RADIATION
UV/ozone cleaning of surfaces
[AD-A024943] N77-12313
ULTRAVIOLET SPECTROPHOTOMETERS
Spectral sensitivity calibration of spectrophotometers --- using standard tungsten quartz lamp
[AML-R7602] N77-12370
UNCOUPLED MODES
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777
UNDERGROUND EXPLOSIONS
Seismic discrimination
[AD-A025777] N77-12627
UNDERGROUND STORAGE
A survey of salt deposits and salt caverns: Their relevance to the strategic petroleum reserve
[PB-255948/2] N77-12500
UNDERWATER STRUCTURES
Metallurgical factors controlling weld metal toughness in the seam welding of line pipe
[PB-256057/1] N77-12415
UNITED STATES OF AMERICA
A survey of fracture mechanics applications in the United States
[AD-A024715] N77-12463
UNSTEADY FLOW
Unsteady transonic flow with heat addition
[AD-A024737] N77-12340
UPPER ATMOSPHERE
Chemical release triangulation and winds in the altitude range 93 km to 176 km
[AD-A024952] N77-12653
UPWASH
Display and calculation of flow past wings in supersonic flight
[ESA-TT-333] N77-12003
URANIUM OXIDES
Oxygen potential of uranium-plutonium oxide as determined by controlled-atmosphere thermogravimetry
N77-12152
URBAN DEVELOPMENT
Planning applications in east central Florida
[E77-10044] N77-12474
Growth effects of major land use projects. Volume 3: Summary
[PB-256204/9] N77-12583
The cost of municipal water supply: A case study
[PB-255960/7] N77-12948
Urban densities for public transportation
[PB-256636/2] N77-12952
URBAN PLANNING
Economic evaluation methods in community planning
[PB-253432/9] N77-12936
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs
[PB-256564/6] N77-12939
Systematic development of methodologies in planning urban water resources for medium size communities: Population characteristics and residential water use
[PB-256566/1] N77-12941
Urban and regional research in Sweden 1974-1975. An annotated list
[PB-256201/5] N77-12949
URBAN RESEARCH
Development of a multi-disciplinary ERTS user program in the state of Ohio
[E77-10045] N77-12475
URBAN TRANSPORTATION
Air quality considerations in transportation planning: Findings and recommendations on transportation control planning, phase 2
[PB-256424/3] N77-12576
Data base design for demand-responsive transit
[PB-256820/2] N77-12945
Personal rapid transit research conducted at the Aerospace Corporation
[PB-256846/7] N77-12946
Transit safety and security: A design framework
[PB-256518/2] N77-12951
Urban densities for public transportation
[PB-256636/2] N77-12952
URETHANES
Effects of the physiological environment on the long-term physical performance of polymeric materials
[NASA-CR-149206] N77-12220
USER MANUALS [COMPUTER PROGRAMS]
US Naval Weather Service numerical environmental products manual
[AD-A024702] N77-12652
XED users manual. Beginning instruction
[AD-A025738] N77-12752
SOL-370 language reference manual and users' guide
[AD-A025927] N77-12753
CENTS-AID II programmer's notebook
[PB-256475/5] N77-12761
USER REQUIREMENTS
Scientific and technical information needs of users or potential users of the DSA-administered, DoD Information Analysis Centers
[AD-A024937] N77-12928

V

V/STOL AIRCRAFT
Advanced V/STOL propeller critical components investigation
[AD-A024663] N77-12063
VACUUM CHAMBERS
DFVLR/AEDC cooperative thermal vacuum test 3
[AD-A024778] N77-12237
VACUUM DEPOSITION
Evaporation and surface energy of a metal deposited in a discontinuous thin film
N77-12179
Investigation of vacuum deposition processes by optical emission spectroscopy
N77-12851
VACUUM EFFECTS
Holographic interferometer background fringe reduction by dual vacuum application
[AD-A024741] N77-12379
VACUUM TESTS
DFVLR/AEDC cooperative thermal vacuum test 3
[AD-A024778] N77-12237
VALUE ENGINEERING
A. P. S. electrostatic scrubber evaluation
[PB-256335/1] N77-12601
VANADIUM OXIDES
Positron, electron and photon interaction experiments
[AD-A025482] N77-12908
VAPOR DEPOSITION
Chemical vapor deposition growth
[NASA-CR-149233] N77-12516
VAPOR PHASES
Vapor phase spectra for air pollution studies
[AD-A025156] N77-12603
VARIANCE [STATISTICS]
The covariance matrix for the solution vector of an equality-constrained least-squares problem
[NASA-CR-149232] N77-12788
A technique for detecting the number of populations falling within a total sample
[AD-A025701] N77-12820
VECTOR ANALYSIS
The covariance matrix for the solution vector of an equality-constrained least-squares problem
[NASA-CR-149232] N77-12788

VEGETATION GROWTH
Relationship between water quality and plant growth in ponds
[PB-256513/3] N77-12594
Reconstruction of past climatic variability
[AD-A024276] N77-12647
VELOCITY
Subjective detection of vertical acceleration: A velocity dependent response?
N77-12678
VELOCITY DISTRIBUTION
Summary and evaluation of theoretical developments relating to trailing wing tip vortices generated by aircraft
[AD-A025614] N77-12007
VELOCITY MEASUREMENT
Fourier analysis and the correlation of speed with nonstationary aerodynamics
N77-11985
Calculation of transonic flows using an extended integral equation method
[NASA-TM-X-74227] N77-12335
High velocity behavior of dislocations in copper
[AD-A025484] N77-12907
VERTICAL MOTION
Subjective detection of vertical acceleration: A velocity dependent response?
N77-12678
Human subjective and reflex responses to sinusoidal vertical acceleration
N77-12679
VERTICAL PERCEPTION
Subjective detection of vertical acceleration: A velocity dependent response?
N77-12678
VERTICAL TAKEOFF AIRCRAFT
Design studies of a motion system for the VTOL simulation facility
[AD-A024732] N77-12075
VESTIBULAR NYSTAGMUS
Effects of sound on the vestibular system
[AD-A025969] N77-12690
VESTIBULAR TESTS
Effects of sound on the vestibular system
[AD-A025969] N77-12690
VESTIBULES
The vestibular system for eye movement control
N77-12674
VIBRATION DAMPING
High-voltage transmission conductor motion research
[PB-255768/4] N77-12318
Mechanical damping of flywheel stabilization systems
N77-12404
Optimum support damping for a vibrating beam
[AD-A025106] N77-12446
VIBRATION MEASUREMENT
A device for detecting amplitudes of vibration of turbodynamo blades
[NLL-M-24095-[5828.4F]] N77-12360
A study of servo accelerometer design for low frequency vibration measurement --- of large structures
[ISVR-TR-85] N77-12369
VIBRATION MODE
Measurement of the motion of trees in two dimensions --- using manual and wind excitation
[ISVR-TR-86] N77-12437
VIBRATIONAL SPECTRA
Vibration and sound radiation of a plate
[AD-A024985] N77-12464
VIEWING
Development of a prototype experimental plan to evaluate stabilized optical viewing devices. 2: Inflight measures of airsickness potential
[AD-A025455] N77-12704
VIGNETTING
Vignetting characteristics of the S-056 X-ray telescope
[NASA-CR-150107] N77-12859
VIKING MARS PROGRAM
Structural analyses for the modification and verification of the Viking aeroshell
[NASA-TN-D-8300] N77-12436
VINYL POLYMERS
Side chain crystallization of long side chain polymers
N77-12217
VIRGINIA
Evaluation of temperature effects on bituminous pavement deflections in Virginia
[PB-255955/7] N77-12456
VISCOELASTICITY
Finite deformation of elastic-plastic and elastic/viscoplastic continua
N77-12429
Methods for solving the viscoelasticity equations for cylinder and sphere problems
[AD-A025302] N77-12800
VISCOSITY
Viscous effects in wate. aves
N77-12326
VISCOUS DAMPING
Analytical comparison of effects of solid-friction and viscous structural damping on panel flutter
[NASA-TN-D-8263] N77-12435
VISUAL ACCOMMODATION
Experimental study of vision dimming in an animal
N77-12716
VISUAL ACUITY
In-flight evaluation of hand-held optically stabilized target acquisition devices
N77-12717
VISUAL AIDS
Flight simulator evaluation of an electronic paravisual guidance indicator
[ESA-TT-350] N77-12056
Visual aids and eye protection for the aviator
[AGARD-CP-191] N77-12708
Integration of aviators eye protection and visual aids
N77-12710
VISUAL CONTROL
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 --- reflex movements of the eye
[DRB-DR-225] N77-12671
The vestibular system for eye movement control
N77-12674
VISUAL PERCEPTION
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976 --- reflex movements of the eye
[DRB-DR-225] N77-12671
Neurophysiology and road safety: Contribution of the frontal lobes to visual orienting
N77-12672
Color inputs to orientation detectors in the human visual system
N77-12673
The effect of auditory and visual presentation of navigational messages on message retention
[PB-256599/2] N77-12706
Vision with the AN/PVS-5 night vision goggle
N77-12715
Image descriptors for display
[AD-A024960] N77-12871
VOICE COMMUNICATION
A secure voice system with bandwidth reduction
[AD-A025433] N77-12275
Development of a speech amplifier system for use with the Navy A4 oxygen breathing apparatus and a proposed firefighting instructor's breathing device
[AD-A025184] N77-12321
VOLCANOES
Remote sensing of geothermic activities of the volcanoes Aetna, Stromboli and Vesuv by means of infrared NOAA-VHRR-satellite data --- Italy
N77-12485
VOLTAGE CONVERTERS [DC TO DC]
Advanced power processing techniques for DC to DC converters
[AD-A025915] N77-12306
VOLTAGE GENERATORS
Parameters affecting electrostatic cooling --- high voltage convective cooling
[NASA-TM-X-73350] N77-12329
VORTEX BREAKDOWN
Low-speed wind-tunnel investigation of flight spoilers as trailing-vortex-alleviation devices on a medium range wide-body tri-jet airplane model
[NASA-TN-D-8360] N77-11968
VORTEX RINGS
Vortex simulation of the pressure field of a jet
[NASA-TM-X-73984] N77-11989
VORTICES
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832

W

WALL PRESSURE
Inlet total pressure loss due to acoustic wall treatment
[NASA-TM-X-73559] N77-11991
WALSH FUNCTION
An approach of developing fast transform algorithms
[AD-A024665] N77-12762
WARFARE
Backlog and delay with wartime airlift
[AD-A025959] N77-12028
WARNING SYSTEMS
Lightning strike warnings for tethered balloon operations
[AD-A025486] N77-12649
National hurricane operations plan
[PB-256824/4] N77-12657
WASTE DISPOSAL
Financial critical factors analysis --- waste treatment management for Miami Valley, Ohio region
[PB-254377/5] N77-12937
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures
[PB-255222/2] N77-12943
WASTE ENERGY UTILIZATION
Selected aspects of waste heat management
[PB-254401/3] N77-12568
WATER
Matrix affinity chromatography and its application to the concentration and separation of trace organics in water
N77-12148
Interactions of water with hydrophilic polyether polyurethanes
N77-12214
WATER CONSUMPTION
Systematic development of methodologies in planning urban water resources for medium size communities phase 1
[PB-256565/3] N77-12940
Systematic development of methodologies in planning urban water resources for medium size communities: Population characteristics and residential water use
[PB-256566/1] N77-12941
WATER COOLED REACTORS
Reflood heat transfer in a light water reactor
[PB-256481/3] N77-12345
WATER FLOW
Effects of radiation penetration on snowmelt runoff hydrographs
[AD-A025763] N77-12489
WATER MANAGEMENT
A compilation of papers presented at the 208 Areawide Water Quality Management Workshops
[PB-254663/8] N77-12561
Evaluation of water quality models: A management guide for planners
[PB-256412/8] N77-12574
The cost of municipal water supply: A case study
[PB-255960/7] N77-12948
WATER POLLUTION
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
Physical and biological aspects of thermal pollution in sea water --- forecasting electric power production in Italy
[ISS-L-75/14] N77-12560
Improving water quality by control of algae: Cellular and extracellular blue-green algal polysaccharides
[PB-254614/1] N77-12563
Ammonia toxicity
[PB-256447/4] N77-12577
Chloride management in Lake Erie Basin
[PB-256241/1] N77-12584
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585
Assessment of the impact of proposed thermal effluent guidelines for the steam electric power industry
[PB-255937/5] N77-12587
WATER QUALITY
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495
A compilation of papers presented at the 208 Areawide Water Quality Management Workshops
[PB-254663/8] N77-12561
Improving water quality by control of algae: Cellular and extracellular blue-green algal polysaccharides
[PB-254614/1] N77-12563
Evaluation of water quality models: A management guide for planners
[PB-256412/8] N77-12574
Toxic heavy metals in groundwater of a portion of the front range mineral belt
[PB-256212/2] N77-12582
Relationship between water quality and plant growth in ponds
[PB-256513/3] N77-12594
Development of a water quality simulation model applicable to Great Salt Lake, Utah
[PB-255718/9] N77-12596
Financial critical factors analysis --- waste treatment management for Miami Valley, Ohio region
[PB-254377/5] N77-12937
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures
[PB-255222/2] N77-12943
Our natural resources: What is our water worth. 1975 - 1978 water quality management planning program, North Central Texas Council of Governments
[PB-256976/2] N77-12947
WATER RESOURCES
Water resources data for New Jersey, water year, 1975
[PB-256802/0] N77-12496
Water resources data for Hawaii and other Pacific areas, water year 1975
[PB-256668/5] N77-12497
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs
[PB-256564/6] N77-12939

Systematic development of methodologies in planning urban water resources for medium size communities phase 1
[PB-256565/3] N77-12940
Systematic development of methodologies in planning urban water resources for medium size communities: Population characteristics and residential water use
[PB-256566/1] N77-12941
An evaluation of public hearings on water development projects in Mississippi
[PB-256583/6] N77-12944

WATER TREATMENT
Selected aspects of waste heat management
[PB-254401/3] N77-12568

WATER VAPOR
The kinetics of evolution of water vapor clusters in air
[AD-A025675] N77-12349

WATER WAVES
Waves generated by a uniformly moving oscillatory surface effect ship
[AD-A025129] N77-12011
Viscous effects in water waves
N77-12326
Bibliography of Soviet Material on Internal Waves, no. 6, November 1975 - April 1976
[AD-A025813] N77-12664

WAVE ATTENUATION
Short-period P wave attenuation along various paths in North America as determined from P wave spectra of the SALMON nuclear explosion
[AD-A025239] N77-12622

WAVE DISPERSION
Analysis of strip line dispersion
N77-12298

WAVE FRONTS
Imagery utilizing multiple focal planes
N77-12852
Two-photon correlations in a widely divergent light beam
N77-12854
Predetection compensated imaging
[AD-A025190] N77-12870

WAVE FUNCTIONS
WKB expansions by path integrals, with applications to the anharmonic oscillator
[AD-A025440] N77-12918

WAVE PROPAGATION
Propagation of multiwavelength laser radiation through atmospheric turbulence
[AD-A024863] N77-12389
Distortion of weak shock and sound waves by atmospheric turbulence
[ESA-TT-355] N77-12616
Computational techniques for the study of infrasound propagation in the atmosphere
[AD-A024951] N77-12836

WAVE REFLECTION
Low frequency wave-reflection properties of the equatorial ionosphere
[AD-A025111] N77-12623

WAVEGUIDES
Mutual coupling in spherical arrays of circular waveguide elements
N77-12290
The parabolic cylinder functions of Miller's second kind for complex parameter
[AD-A025314] N77-12801
IR optical wave guide
[AD-A025953] N77-12874

WEATHER
Application of building climatology to the problems of housing and building for human settlements
[WMO-441] N77-12640
Mariners weather log, volume 20, number 3, May 1976
[PB-250014-03] N77-12659

WEATHER FORECASTING
A plan for application system verification tests: The value of improved meteorological information, volume 1 — economic consequences of improved meteorological information
[NASA-CR-149210] N77-12634
A plan for application system verification tests. The value of improved meteorological information, volume 2 — economic consequence of improved meteorological information
[NASA-CR-149169] N77-12635
A plan for application system verification tests--The value of improved meteorological information: Executive summary — economic consequence of improved meteorological information
[NASA-CR-149168] N77-12636
National hurricane operations plan
[PB-256824/4] N77-12657
National several local storms operation plan
[PB-256717/0] N77-12658

WEATHER STATIONS
Climatological data of Netherlands stations. Volume 9: Tables with data of aerodromes Amsterdam/Schiphol, Eindhoven/Eindhoven, Enschede/Twente, Groningen/Eelde, Maastricht/Zuid-Limburg and Rotterdam/Rotterdam according to observations in the period 1955 - 1970
[KNMI-150-9] N77-12646

WEATHERING
Environmental effects on maintenance costs for aircraft equipment
[AD-A025801] N77-12048
Weathering and weatherability of rocks: Experiments on thermal fatigue of non-igneous rocks
[AD-A025598] N77-12619

WEBS [SHEETS]
Web-dendritic ribbon growth
[NASA-CR-149237] N77-12512

WEIBULL DENSITY FUNCTIONS
Investigate fiber reinforced Si13N4
[AD-A025901] N77-12137

WEIGHTLESSNESS SIMULATION
Float-zone processing in a weightless environment
[NASA-CR-2768] N77-12954

WELD STRENGTH
Ship steel weldments for low temperature service
[PB-256997/8] N77-12203
Metallurgical factors controlling weld metal toughness in the seam welding of line pipe
[PB-256057/1] N77-12415

WELDABILITY
The welding of organic coated steels and laminates
[PB-256056/3] N77-12416

WELDED JOINTS
Finite element simulation of weldbonded joint deformation
[PB-256995/2] N77-12455

WENTZEL-KRAMER-BRILLOUIN METHOD
On the semi-classical expansion in quantum mechanics for arbitrary Hamiltonians
[AD-A025441] N77-12917

WHEAT
The Large Area Crop Inventory Experiment [LACIE]
[NASA-TM-X-74225] N77-12480

WHISKER COMPOSITES
Further development and application of polycrystalline metal whiskers
[BMFT-FB-T-76-18] N77-12219

WIND [METEOROLOGY]
Chemical release triangulation and winds in the altitude range 93 km to 176 km
[AD-A024952] N77-12653

WIND EFFECTS
Measurement of the motion of trees in two dimensions — using manual and wind excitation
[ISVR-TR-86] N77-12437

WIND MEASUREMENT
Synoptic thermal wind calculations from radiosonde observations over the southwestern United States
[AD-A025693] N77-12655

WIND SHEAR
Turbulent atmospheric flow over a backward-facing step
[NASA-CR-2749] N77-12639

WIND TUNNEL CALIBRATION
Design features and operational characteristics of the Langley 0.3-meter transonic cryogenic tunnel
[NASA-TN-D-8304] N77-12071

WIND TUNNEL MODELS
Application of the computer for on-site definition and control of wind tunnel shape for minimum boundary interference
N77-11975
Adaptation of the Joppa method to a wind tunnel with variable permeability
N77-11976
Experiments planned specifically for developing turbulence models in computations of flow fields around aerodynamic shapes
N77-11982
Wind tunnel models for aero-optical interaction study
[AD-A024925] N77-12078
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832

WIND TUNNEL NOZZLES
Advanced porous transonic wind-tunnel nozzles
[NASA-TM-X-73180] N77-12069

WIND TUNNEL STABILITY TESTS
Numerical methods and windtunnel testing
[AGARD-CP-210] N77-11969
Operational use of computers associated with the Modane wind tunnels
N77-11971
Applications of the real-time data analysis system in the Ames 40- by 80-foot wind tunnel
N77-11972
Wind tunnel tests and aerodynamic computations; thoughts on their use in aerodynamic design
N77-11979
Low-speed wind-tunnel investigation of a large scale advanced arrow-wing supersonic transport configuration with engines mounted above wing for upper-surface blowing
[NASA-TN-D-8350] N77-11997
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 1
[NASA-CR-147646] N77-12109
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 2
[NASA-CR-147647] N77-12110

WIND TUNNEL TESTS
Low-speed wind-tunnel investigation of flight spoilers as trailing-vortex-alleviation devices on a medium range wide-body tri-jet airplane model
[NASA-TN-D-8360] N77-11968
Wind tunnel investigation of internally blown jet-flap STOL airplane model
[NASA-TN-D-8309] N77-11995
Aerodynamic coefficients and position of the bow shock wave of circular cones with pointed and spherically blunted noses in supersonic flow
[ESA-TT-335] N77-12005
A low speed wind tunnel test of a 0.050 scale model of shuttle orbiter [model 089B] to investigate the longitudinal and lateral directional effects of canard and tail configurational modifications in the LTV LSWT [MA14]
[NASA-CR-147649] N77-12111
Mean flow and turbulence measurements in the wake of slender propeller-driven bodies including effects of pitch angle
[AD-A031088] N77-12337
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832

WIND TUNNEL WALLS
Minimizing wall interference in connectional transonic test sections by using computer parametric studies
N77-11978
Numerical simulation of three dimensional transonic flow including wind tunnel wall effects
N77-11984

WIND TUNNELS
Some experiences with the exploitation of measurements of the perturbation field in a wind tunnel to improve simulation
N77-11974

WIND VELOCITY
Turbulent flux estimates from shipboard mean wind and temperature profiles and dissipation rates
[AD-A025438] N77-12650

WINDPOWER UTILIZATION
Wind power prediction models
[NASA-CR-149235] N77-12509

WINDPOWERED GENERATORS
Costs of alt rnative sources of electricity
[PB-255765/0] N77-12528

WING FLAPS
Generalization and refinement of an automatic landing system capable of curved trajectories
[NASA-TN-D-8336] N77-12032

WING TIP VORTICES
Summary and evaluation of theoretical developments relating to trailing wing tip vortices generated by aircraft
[AD-A025614] N77-12007

WINGS
Display and calculation of flow past wings in supersonic flight
[ESA-TT-333] N77-12003
F-111a wing fatigue test program
[AD-A025795] N77-12049

WROUGHT ALLOYS
High strength-high damping capacity wrought magnesium alloys
[AD-A025164] N77-12212

X

X RAY ANALYSIS
Radiation exposure of the Italian population due to medical diagnostic examinations in 1974
[ISS-P-75/13] N77-12683

X RAY DIFFRACTION
Side chain crystallization of long side chain polymers
N77-12217
High order Borrmann diffraction
N77-12883
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper [I] oxime imines of 2, 3-butanedione
N77-12889

X RAY FLUORESCENCE
A comparison of practical and theoretical correction factors for use in X-ray fluorescence analysis of oxide materials
[PB-256054/8] N77-12165

X RAY SPECTRA
Spectral effects on cross-sectional reconstruction from X-rays
N77-12855

X RAY SPECTROSCOPY
A comparison of practical and theoretical correction factors for use in X-ray fluorescence analysis of oxide materials
[PB-256054/8] N77-12165
X RAY TELESCOPES
Vignetting characteristics of the S-056 X-ray telescope
[NASA-CR-150107] N77-12859

Y

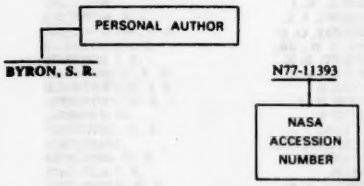
YAG LASERS
Development and fabrication of a space hardened Nd[+3] YAG laser transmitter system for orbital range and altitude control
[AD-A025155] N77-12107

Z

ZINC
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy
N77-12178

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABBATT, F. W. N77-12249
ABBOTT, E. S. N77-12126
ABBOTT, W. Y. N77-12043
ABELES, F. N77-12162
ABOU-ALY, A. I. A. M. N77-12891
ABRAM, P. N77-12478
ADAIR, A. M. N77-12196
AGENO, H. Y. N77-12393
AHREN, P. N77-12936
AHRENS, T. J. N77-12987
AIRES-BARROS, L. N77-12619
AKIMA, H. N77-12267
ALDRICH, B. R. N77-12070
ALEXANDER, A. J. N77-12687
ALEXANDER, G. D. N77-12655
ALFVEN, H. N77-12959
ALIKHAN, M. S. N77-12724
ALPATOV, A. P. N77-12404
AMASON, M. P. N77-12039
AMMANN, E. O. N77-12392
ANDERSEN, E. N77-12424
ANDERSON, D. H. N77-12631
ANDERSON, D. N. N77-12406
ANDERSON, M. S. N77-12436
ANDERSON, T. O. N77-12721
ANDERSON, V. E. N77-12902
ANDERSON, W. E. N77-12226
ANDERSON, W. L. N77-12795
ANDREWS, J. G. N77-12421
ANG, D. S. L. N77-12359
ANTHONY, P. L. N77-12390
ANTINONE, R. J. N77-12904
APPLETON, D. A. N77-12409
APRUZESE, J. P. N77-12284
ARKLES, L. L. N77-12813
ARMSTRONG, R. L. N77-12386
ARNETT, G. D. N77-12053
ARRHENIUS, G. N77-12959
ASHANY, R. N77-12921
ASHLEY, J. C. N77-12902
ASHLEY, J. R. N77-12282
ATHANS, M. N77-12779
ATKINSON, H. E., III N77-12650
AURIOL, A. N77-12352
AUTH, J. A., II N77-12827
AVARA, E. P. N77-12865
AVERNER, M. M. N77-12718
AVERY, J. N77-12539
AVERY, W. H. N77-12552
AYERS, O. E. N77-12235

B

BACA, F. L. N77-12275
BAER, M. R. N77-12158
BAGGALEY, A. N77-12600
BAKER, D. J. N77-12618
BAKER, N. E. N77-12447
BAKER, S. M. N77-12455
BAKER, W. E. N77-12466
BAKHSHIYAN, B. T. N77-12118
BALAKIR, S. E. N77-12173
BALAS, C. N77-12372
BALAS, E. N77-12828
BALDRIDGE, P. E. N77-12475
BALL, J. W. N77-12108
N77-12109
N77-12110
BALLIET, L. N77-12772
BAR-ZIV, E. N77-12170
BARAONA, C. R. N77-12523
BARATONO, J. N77-12113
BARBARIKA, H. N77-12601
BARLEY, T. A. N77-12282
BARNES, P. W. N77-12473
BARSIS, A. P. N77-12266
BASIN, M. N77-12716
BASU, A. P. N77-12811
BASU, S. N77-12628
BATDORF, S. B. N77-12451
BATHALA, C. T. N77-12939
BAUER, S. H. N77-12170
BAUN, W. L. N77-12188
N77-12200
N77-12442
BAYNE, M. A. N77-12181
BAZHAN, L. A. N77-12174
BEACHLEY, N. H. N77-12536
BEARD, M. E. N77-12562
BEARD, R. B. N77-12835
BECATTINI, G. N77-12768
BEHAR, I. N77-12860
BEHRIN, E. N77-12525
BELL, J. M. N77-12940
BELL, P. D. N77-12194
BELLI, M. N77-12684
BELSTERLING, C. A. N77-12075
BELYTSCHKO, T. N77-12686
BENASSI, S. N77-12683
BENEDETTO, S. N77-12769
BENESH, F. H. N77-12583
BENNER, B. L. N77-12563
BENNETT, E. N77-12576
BENNETT, J. G. N77-12787
BENNETT, L. H. N77-12166
BENNETT, W. G. N77-12273
BENSON, T. P. N77-12042
BERG, R. G. N77-12156
BERGMAN, F. J. N77-12562
BERKO, S. N77-12908
BERLINGHOFF, W. P. N77-12826
BERNSTEIN, H. N77-12946
BERTIN, J. J. N77-12127
BESSEY, M. N77-12576
BEZOUSKA, T. J. N77-12458
BHAR, J. N. N77-12628
BHATT, A. D. N77-12291
BHATTACHARYYA, G. N. N77-12628
BHATTACHARYYA, R. K. N77-12465
BIALIK, J. J. N77-12926
BIARD, J. R. N77-12861
BIBL, K. N77-12630
BIEGEL, J. N77-12293
BIGLIERI, E. N77-12769
BIRGE, R. R. N77-12603
BIRLA, N. C. N77-12196
BIRNBAUM, H. K. N77-12211
BITER, W. J. N77-12553
BITTE, J. N77-11996
BLACK, L. M. N77-12256
BLACKBURN, A. M. N77-12561
BLACKBURN, M. J. N77-12193
BLACKWELL, L. M. N77-12246
BLASING, T. J. N77-12647
BLAU, P. J. N77-12210
BLEVINS, R. W. N77-12552
BLISS, D. F. N77-12515
BOARDMAN, R. A. N77-12079
BODNER, S. E. N77-12881
BOGHOSSIAN, A. B. N77-12786
BOLD, N. T. N77-12245
N77-12246
BOMBA, M. N77-12685
BOND, M. T. N77-12593
BONDURANT, A. J., JR. N77-12503
BONESS, J. W. N77-12399
BOOTH, J. M. N77-12869
BOPPANA, R. R. N77-12782
BOREN, H. E., JR. N77-12929
BORIO, R. W. N77-12598
BORISOV, E. M. N77-12175
BOTINEAU, J. N77-12159
BOTTONE, A. G. N77-12556
BOURNE, J. G. N77-12510
BOURRELY, C. N77-12842
BOWMAN, B. M. N77-12702
BOXWELL, D. A. N77-12060
BOYLAN, L. H. N77-12664
N77-12994
BRADLEY, L. M. N77-12873
BRAGGINS, T. T. N77-12886
BRANDEWIE, R. A. N77-12280
BRANDHORST, H. W., JR. N77-12519
N77-12523
BRAUNSTEIN, A. I. N77-12396
BREEN, L. Z. N77-12940
N77-12941
BRENEMAN, W. C. N77-12514
BRENNAN, D. H. N77-12709
BRENNAN, J. J. N77-12137
BREWER, D. A. N77-12609
BRICZINSKI, S. J. N77-12045
BRODY, T. P. N77-12553
BROOKE, R. N., JR. N77-12602
BROOKS, D. R. N77-12119
BROUNS, A. J. N77-12263
BROWN, K. M. N77-12765
BROWN, M. N77-12823
BROWN, R. D. N77-12691
BROWN, T. J. N77-12064
BROWN, W. P. N77-12870
BRUGGEMAN, G. A. N77-12206
BUCHNER, S. P. B. N77-12887
BUCKANIN, R. M. N77-12042
BUCY, W. E. N77-12153
BURHANS, R. W. N77-12606
BURNS, C. P. N77-12283
BURS, L. N77-12608
BUSCH, R. N77-12181
BUTTERWORTH, A. N77-12205
BYKOVETZ, N. N77-12888
BYRD, J. L. N77-12104

C

CALAMIA, M. N77-12298
CALLENDER, R. E. N77-12872
CALVERT, J. G. N77-12575
CALVERT, S. N77-12601
CAMPBELL, H. M. N77-12364
CAMPOSVENUTI, G. N77-12072
CANNON, S. N77-12337
CANTOR, C. J. N77-12617
CANTOR, S. N77-12035
CAPITANI, G. P. N77-12072
CAPPELLINI, V. N77-12818
CARDONE, J. M. N77-12859
CARLON, H. R. N77-12631
CARLSON, C. R. N77-12871
CARMICHAEL, D. C. N77-12524
CARPENTER, A. G. N77-12007
CARR, S. H. N77-12225
CARTER, A. F. N77-12022
CARTER, E. A. N77-12507
CARTER, G. C. N77-12834
CARTWRIGHT, D. J. N77-12463
CARUTHERS, J. E. N77-12017
CASE, K. M. N77-12807
CASTELLANI, V. N77-12769
CASTLE, C. B. N77-12027
CATRAVAS, G. N. N77-12667
CAUDRON, R. N77-12187
CECIL, R. A. N77-12192
CERF, V. G. N77-12260
N77-12261
N77-12262
CHAMBERS, T. G. N77-12087
N77-12088
N77-12089
N77-12090
N77-12091
CHAMBLISS, E. B. N77-12111

CHAN, A. N77-12372
CHAN, P. W. N77-12880
CHANDRA, D. N77-12499
CHANG, D. C. N77-12376
CHANIN, M. L. N77-12615
CHAPMAN, R. D. N77-12990
CHARAP, J. M. N77-12843
CHASE, W. D. N77-12031
CHATOPADHYAY, S. N77-12445
CHAUVIN, J. N77-12025
CHEN, C. F. N77-12026
CHEN, J. M. N77-12320
CHEN, P. C. N77-12910
CHEN, R. Y. N77-12840
CHEN, Y. N. N77-12341
CHERNOFF, H. N77-11988
CHERNUKH, A. M. N77-12822
CHERRIER, C. M. N77-12693
CHEVALERAUD, J. P. N77-12180
N77-12713
N77-12714
N77-12716
CHEVALERIAS, R. N77-12615
CHEW, W. M. N77-12235
CHINNERY, M. A. N77-12627
CHINZEI, N. N77-12336
CHISUM, G. T. N77-12710
CHOU, P. C. N77-12135
CHRISTENSEN, J. D. N77-12294
CHRISTMAN, R. C. N77-12597
CHRISTOFIDES, N. N77-12799
CHRISTOPHER, J. P., JR. N77-11977
CHU, Y. Y. N77-12695
CHUNG, K. M. N77-12736
CHURCHILL, E. N77-12697
N77-12699
CHURCHILL, R. J. N77-12880
CINDRICH, I. N77-12317
CLAIRE, E. J. N77-12272
CLARK, G. E. N77-12050
CLARK, R. M. N77-12948
CLARKE, R. S., JR. N77-12958
CLASPY, P. C. N77-12864
CLAYTON, J. Q. N77-12190
CLEMENT, W. F. N77-12055
CLYDE, C. G. N77-12596
CODY, G. D. N77-12871
COE, P. L., JR. N77-11997
N77-12065
COHEN, R. W. N77-12871
COLANGELO, V. J. N77-12208
COLBECK, S. C. N77-12489
COLE, M. R. N77-12373
COLLINS, T. A. N77-12230
COLONNA-ROMANO, L. M. N77-12625
COMINSKY, A. N77-12039
COMPARIN, R. A. N77-12341
COOPER, E. R. N77-12941
COOPER, R. L. N77-12525
CORBE, C. N77-12713
CORRIDORE, M. C. N77-12928
CORTELLESSA, G. N77-12072
CORYNEN, G. C. N77-12790
COSBY, P. C. N77-12163
COUNCIL, F. M. N77-12950
COURT, L. N77-12716
COUSTON, M. N77-11983
COX, H. J. A. N77-12020
COX, R. N77-12337
COY, S. L. N77-12241
CRAIN, C. M. N77-12286
CRAWFORD, M. L. N77-12376
CREMONESE, M. N77-12684
CROOM, D. R. N77-11968
CROWDER, G. W. N77-12535
CUDAHY, G. F. N77-12398
CUDDIHY, E. N77-12220
CUER, M. N77-12794
CUMMINGS, T. B. N77-12621
CUNNINGHAM, H. J. N77-12435
CURLETTE, W. L. N77-12815
CURRIE, G. D. N77-12317
CURTISS, H. C., JR. N77-12040
CUTCHEN, J. T. N77-12711

D

DAFFAN, E. B. N77-12337
DAGOSTINO, R. N77-12583
DALABA, E. M. N77-12103
DALTON, J. W. N77-12772
DAOUST, M. N77-12407
DASGUPTA, A. N77-12628
DAUNAIS, R. A. N77-12373
DAVIES, P. N77-12676
DAVIES, W. E. R. N77-12010
DAVIS, J. N77-12284
DAVIS, J. R. N77-12319
DAVIS, P. A. N77-12564
DAVIS, R. A., JR. N77-12734
DAVIS, W. C. N77-12280
DAVIS, W. R. N77-12016
DAWSON, J. F. N77-12425
DEABENDERFER, P. R. N77-12621
DEADMORE, D. L. N77-12184
DEANGELO, L. N77-12448
DEARAUJO, F. F. T. N77-12143
DEBLOOIS, R. C. N77-12307
DEFREITAS COUTINHO, E. N77-12623
DEGEORGE, W. A. N77-12034
DEHOFF, R. T. N77-12221
DELALE, F. N77-12131
DELEEUW, J. H. N77-12010
DELLEUR, J. W. N77-12940
DELPINO, G. E. N77-12808
DELRE, E. N77-12818
DEMEO, E. A. N77-12551
DEMETRAKOPOULOS, T. N77-12372
DEMILLO, R. A. N77-12748
DEMIRAY, H. N77-12136
DEMOREST, K. E. N77-12329
DEMOURA, J. M. F. N77-12036
DEOLIVARES, D. R. N77-12381
DEPIERRE, V. N77-12196
DER, Z. A. N77-12622
DERRICK, M. R. N77-12051
DERRINGTON, C. E. N77-12892
DESANCTIS, E. N77-12072
DESIZE, L. K. N77-12302
DESPAIN, A. N77-12807
DESTARLAIS, A. O. N77-12510
DEVINE, D. J. N77-12590
DEVOCHT, J. W. N77-12388
DEWITT, E. N77-12647
DICARLO, D. J. N77-12066
DICK, M. J. N77-12037
DICKINSON, S. O. N77-11972
DICKSON, E. M. N77-12533
N77-12534
DILL, J. D. N77-12837
DINGER, R. J. N77-12319
DOBICI, F. N77-12683
DODGE, F. R. N77-12347
DOLMAN, J. A. N77-11970
DOMALSKI, E. S. N77-12633
DORPH-PETERSEN, P. N77-12642
DOSSANTOS, R. N77-12623
DOUGLAS, A. V. N77-12660
DOWNEY, G. D. N77-12382
DOWNING, G. H. N77-12679
DRAKE, J. F. N77-12878
DRANOVSKII, V. I. N77-12404
DREHER, J. J. N77-12199
DSILVA, T. N77-12913
DUBBERLEY, D. N77-12337
DUCKWORTH, R. A. N77-12355
DUEWER, D. L. N77-12169
DUFFY, T. W. N77-12701
DUGGER, G. L. N77-12552
DUNKER, R. N77-12024
DUSHKIN, L. S. N77-12080
DWYER, S. J., III N77-12122
DYRING, E. N77-12732
DYSON, F. J. N77-12479
N77-12807

E

EARL, J. R. N77-12772
EASTEAL, A. J. N77-12229
EBERLY, J. H. N77-12845
ECKERT, W. T. N77-11993
ECKLUND, W. L. N77-12270
EDRIS, J. H. N77-12050
EDWARDS, C. R. N77-12108
EDWARDS, H. D. N77-12653
EDWARDS, K. W. N77-12582
EGGUM, G. E. N77-12448
EHRENREICH, H. N77-12538
EISEN, H. A. N77-12311
EISENSTAT, S. C. N77-12748
ELDIGHIDY, S. M. N77-12341
ELKUS, B. J. N77-12557
ELMORE, R. G. N77-12168
ELSON, J. M. N77-12866
ELTERMAN, P. B. N77-12325
ELYASBERG, P. Y. N77-12118
EMERY, A. F. N77-12454
EMUNDS, H. N77-12004
N77-12005
ENDO, K. N77-12178
ENGELS, G. J. N77-12310
ENINGER, J. E. N77-12182
ENOS, B. E. N77-12146
EPSTEIN, A. S. N77-12311
EPSTEIN, G. L. N77-12844
ERDOS, J. N77-12106
ERICKSON, B. K. N77-12314
ERINGEN, A. C. N77-12136
N77-12140
ERNEST, F. P. N77-12550
ESCALANTE, E. N77-12202
ESCH, P. N77-11981
ESPARZA, E. D. N77-12447
ESPARZA, F. N77-12474
ESSERS, I. N77-12993
ESTLER, R. C. N77-12885
ESTRIN, G. N77-12771
EVANS, W. E. N77-12488
EVIATAR, A. N77-12989

F

FAHRENKROG, S. L. N77-12449
FARASSAT, F. N77-12064
FARCHI, G. N77-12072
FARDEN, D. C. N77-12819
FARR, E. N77-12035
FARRELL, R. J. N77-12869
FASCHING, J. L. N77-12169
FAUGERAS, O. D. N77-12849
FAUST, J. W., JR. N77-12512
FAWCETT, B. K. N77-12726
FEATHER, A. E. N77-12305
FEDORS, R. N77-12220
FEENEY, W. J. N77-12194
FENG, T. Y. N77-12762
FIKE, R. M. N77-12117
FINNEMORE, E. J. N77-12574
FINUCANE, R. G. N77-12765
FISCH, O. N77-12472
FISHBEYN, B. D. N77-12057
FISHER, E. G. N77-12744
FISK, W. J. N77-12099
FLAMINI, M. N77-12685
FLANNERY, R. E. N77-12872
FLEISCHMAN, G. L. N77-12182
FLEMING, M. L. N77-12068
FLORENCE, R. A. N77-12858
FONSECA, G. F. N77-12696
FOREMAN, J. W., JR. N77-12859
FOSTER, G. W. N77-12067
FOWLE, A. A. N77-12954
FOWLER, C. C., JR. N77-12223
FOX, W. T. N77-12734
FRANCIS, E. J. N77-12552
FRANCIS, R. L. N77-12770
FRANDSEN, J. D. N77-12207
FRANK, A. A. N77-12536
FRANK, L. A. N77-12620
FRANKE, R. N77-12804
FRANKLIN, A. D. N77-12166
FRANT, M. S. N77-12570
FRAZIER, J. W. N77-12703
FREEDMAN, E. N77-12271
FRERICKS, D. E. N77-12044
FRITTS, H. C. N77-12647
FRITZ, P. N77-11981
FRITZ, W. N77-11984
FROBOESE, M. N77-12833
FROST, J. D., JR. N77-12680
FROST, W. N77-11996
N77-12639
FRULLANI, S. N77-12072
FULKERSON, C. R. N77-12401
FUNG, Y. T. N77-11989
FUTRAL, S. M., JR. N77-12000

G

GAGNON, R. A. N77-12487
GAHN, R. F. N77-12522
GAHR, S. N77-12211
GAINES, G. B. N77-12524
GAKHUN, G. G. N77-12080
GAL, G. N77-12391
GALLAGHER, J. P. N77-12230
GARCIA, B. N77-12396
GARLAND, J. G. N77-12415
GARMS, G. A. N77-12127
GARONE, L. C. N77-12515
GARRETT, D. L. N77-12429
GARVIN, D. N77-12633
GASPART, P. N77-12776
GATLING, F. P. N77-12706
GATSKI, T. B. N77-12344
GAUNAURD, G. C. N77-12800
GAUSE, R. L. N77-12329
GAVRILOVA, I. P. N77-12893
GECIT, M. R. N77-12132
GEIS, J. W. N77-12541
GELFAND, A. E. N77-12820
N77-12821
GELLES, S. H. N77-12209
GENIN, J. N77-12446
GERHOLD, W. F. N77-12202
GIANNOVARIO, J. A. N77-12144
GILLESPIE, P. S. N77-12386
GINOUX, J. J. N77-12356
GIORDANO, T. A. N77-12321
GIRARD, A. N77-12615
GLANGEAUD, F. N77-12614
GLASCOCK, L. A. N77-12441
GLICK, D. D. N77-12704
N77-12717
GODOY, S. G. N77-12310
GOERING, H. L. N77-12130
GOLDSTEIN, J. N77-12319
GOLLAKOTA, S. N77-12334
GOODYER, M. J. N77-11975
GORDON, H. N77-12234

GORDON, S. I. N77-12472
GORSHKOV, A. G. N77-12432
GOSNELL, P. N77-12268
GOTTESMAN, S. T. N77-12985
GOUGAT, P. N77-11985
GRAEFE, H. J. N77-11986
GRAF, O. N77-12093
GRALL, L. N77-12177
GRAY, R. F. N77-12276
GRECO, S. N77-12682
N77-12684
GREEN, A. E. N77-12915
GREENBAUM, S. A. N77-12507
GREENBERG, B. N77-12668
GREENE, J. E. N77-12895
GREENEICH, E. W. N77-12553
GREENSTEIN, J. S. N77-12695
GREENWALD, R. A. N77-12270
GRENAT, G. N77-11971
GRENNEY, W. J. N77-12596
GRICIA, M. N77-12724
GRIEDER, W. F. N77-12629
GRIMES, P. R. N77-12191
GRIMSRUD, G. P. N77-12574
GRINGAUZ, K. I. N77-12611
N77-12612
GROSHKOVA, G. N. N77-12893
GROUNDS, J. D. N77-12457
GRUBISIC, V. N77-12431
GRUNBAUM, B. W. N77-12157
GUEDRY, F. E., JR. N77-12704
GUERRERO-GARCIA, J. C. N77-12605
GUHATHAKURFA, B. K. N77-12628
GUITTON, D. N77-12672
GULDBERG, P. N77-12583
GUNN, J. A. N77-11977
GUPTA, A. K. N77-12811
GUPTA, P. K. N77-12412
GUREVICH, A. M. N77-12175
GURGANUS, T. B. N77-12197
GURNETT, D. A. N77-12620

H

HAAS, J. E. N77-12000
HABEL, P. G. N77-12394
HAGAN, M. P. N77-12617
HAGEVIK, G. N77-12561
HAGGERTY, J. S. N77-12874
N77-12954
HALL, G. S. N77-12197
HALL, J. A. N77-12191
HALL, J. W. N77-12444
HALLOWELL, J. B. N77-12501
HALSEY, N. N77-12224
HAMILTON, H. B. N77-12322
HAMMER, A. N77-12894
HAMMERAND, R. N77-12105
HAMPE, G. D. N77-12944
HAMPSON, R. F. N77-12633
HANCOCK, G. R. N77-12039
HANEY, J. T. N77-12603
HANNAH, J. W. N77-12474
HANNON, R. J. N77-12464
HANSEN, J. N77-12250
HANSON, R. L. N77-12145
HAPPE, R. P. N77-12083
HARDEN, D. N77-12473
N77-12508
HARDIN, B. L. N77-12397
HARDY, W. G. S. N77-11973
HARKAY, J. R. N77-12289
HARRIS, F. E. N77-12903
HARRIS, J. O. N77-12711
HARRISON, W. B. N77-12323
N77-12513
HART, D. A. N77-12255
HARTLEY, A. M. N77-12590
HARVEY, C. N77-12576
HASHIYAMA, M. N77-12215
HATCHARD, C. G. N77-12370
HAUG, E. J., JR. N77-12421
HAWLEY, A. V. N77-12039
HAYES, C. L. N77-12280
N77-12395
HAZELTON, R. C. N77-12880
HEAPS, J. D. N77-12513
HEARN, D. N77-12796
HEATHCOTE, C. N77-12371
HEIN, L. A. N77-12402
HEIN, R. A. N77-12906
HELLER, D. N77-12754
HENDERSON, J. H. N77-12006
HENDERSON, M. D. N77-12537
HENDRICKSON, G. N77-12513
HENRY, V. F. N77-12247
HENSON, T. F. N77-12777
HERMAN, C. F. N77-12239
HERVERT, G. L. N77-12529
HIBBEN, S. G. N77-12387
N77-12664
N77-12994
HIGGINS, R. L. N77-12780
HIGHTER, W. H. N77-12077
HILBERT, E. E.
HILBORN, R. B., JR.
HILDENBRAND, D. L.
HILL, B. M.
HILTNER, L.
HINCKS, J. A.
HIRSCH, C.
HIRSCHEL, E. H.
HISSONG, D. W.
HIXSON, W. C.
HO, D. S. M.
HODULAK, L.
HOFFSTEDT, D. J.
HOFMANN, M. A.
HOFTON, M. E.
HOGENCAMP, R. W.
HOKANSON, L. D.
HOLLY, F. F.
HOLMES, J. F.
HOLMES, P.
HOPPER, R. A.
HORN, J. D.
HORNE, M. A.
HOTZ, G. M.
HOUGHTON, J. R.
HOWELL, W. E.
HOYLE, W. A.
HOYT, D. V.
HSIAO, J. K.
HSIEH, H. W. S.
HSU, J. M. J.
HUANG, R. C.
HUBBARTT, J. E.
HUDDLESTON, G. K.
HUDSON, W. R.
HUESTIS, S. P.
HUGGINS, R. A.
HUGHES, E. E.
HULLEY, M. A.
HUMPHREY, T. L.
HUNT, M.
HUNT, R. J.
HUNTER, W. W.
HUPPI, R. J.
HUTCHINSON, R. L.
HUTTON, P. H.
HWANG, L. Y. L.

I

IDAR, E. S., III
IGOU, R. D.
ILLINGER, J. L.
INDOVINA, P. L.
INGHAM, J.
ISAACMAN, R.
ISENBERG, J.
ISHII, S.
ISKRA, E. S.
ITALIANO, M. L.
IVANOV, M. I.

J

JACKSON, J. W.
JACOB, R. J. K.
JACOBS, N. H.
JAFFE, R. J.
JAIKRISHNAN, K.
JAKUBOWSKI, A. K.
JAMES, R. E.
JAVAN, A.
JEFFERS, W. Q.
JEFFERY, R. W.
JENKINS, O. C.
JENSEN, E. T.
JENSEN, G.
JEROSLOW, R. G.
JIRIK, C. J.
JOHANNSEN, K.
JOHNSON, R. E.
JOHNSSON, R. K.
JOHNSTON, A. G.
JOHNSTON, P. E.
JOHNSTON, P. J.
JOHNSTON, R. H., III
JOKELA, A. W.
JONES, C. J.
JONES, D. J.
JONES, G. M.
JONES, H. L.
JONES, R. A.
JONES, W. L., JR.
JOPE, J.
JORDAN, W. E.
N77-12240
N77-12512
N77-12164
N77-12824
N77-12323
N77-12418
N77-12018
N77-12338
N77-12231
N77-12704
N77-12725
N77-12439
N77-12052
N77-12579
N77-12204
N77-12515
N77-12047
N77-12715
N77-12389
N77-12414
N77-12277
N77-12655
N77-12900
N77-12000
N77-12831
N77-12218
N77-12759
N77-12632
N77-12278
N77-12217
N77-12783
N77-12421
N77-12128
N77-12283
N77-12847
N77-12661
N77-12542
N77-12533
N77-12534
N77-12251
N77-12926
N77-12205
N77-12638
N77-12950
N77-12618
N77-12444
N77-12425
N77-12155
N77-12127
N77-12524
N77-12214
N77-12683
N77-12685
N77-12220
N77-12988
N77-12440
N77-12336
N77-12259
N77-12943
N77-12343
N77-12571
N77-12720
N77-12467
N77-12167
N77-11987
N77-12337
N77-12700
N77-12896
N77-12393
N77-11970
N77-12802
N77-12561
N77-12642
N77-12797
N77-12798
N77-12500
N77-12247
N77-12516
N77-12735
N77-12649
N77-12270
N77-11994
N77-12351
N77-12566
N77-12596
N77-11980
N77-12671
N77-12674
N77-12675
N77-12676
N77-12678
N77-12679
N77-12112
N77-12332
N77-12363
N77-11993
N77-12102
JOY, E. B. N77-12283
JUDD, M. N77-11975

K

KAHLER, R. C. N77-12623
KAISER, M. A. N77-12147
KAM, J. B. N. N77-12743
KAMINSKI, H. N77-12484
N77-12485
KAMMEYER, W. N77-12323
KANEVSKII N77-12242
KAPUR, V. K. N77-12171
KAPUSTKA, R. E. N77-12511
KARASZ, F. E. N77-12225
KARGE, H. N77-12898
KARLSEN, L. K. N77-12331
KATTAWAR, G. W. N77-12665
N77-12862
KATZ, J. N77-12807
KATZENBERGER, J. M. N77-12154
KAUBA, F. N77-12001
KAUL, U. K. N77-12639
KAWATA, K. N77-12434
KAYSER, R. F., JR. N77-12784
KAZMERSKI, L. L. N77-12546
KEISLER, S. R. N77-12610
KELLER, G. E. N77-12625
KELLY, M. W. N77-11972
KENNEY, G. N77-12372
KENT, T. J. N77-12062
KENTY, J. L. N77-12516
KERAMATI, B. N77-12919
KERR, J. R. N77-12389
KERR, T. W. N77-12201
KERR, W. R. N77-12195
KESEL, P. G. N77-12654
KILGORE, R. A. N77-12071
KIM, C. H. N77-12011
KIM, Y. W. N77-12216
KIMBERLIN, S. R. N77-12880
KIMBLETON, S. R. N77-12774
KING, D. B. N77-12209
KING, D. W. N77-12927
KINNEY, W. A. N77-12836
KIRCHNER, W. L. N77-12345
KIREEV, V. I. N77-12343
KIRKPATRICK, J. C. N77-12092
KIRKWOOD, P. R. N77-12415
KIRSANOV, V. P. N77-12404
KIRSTEIN, P. T. N77-12253
KISTLER, C. W. N77-12524
KLEIN, B. W. N77-12502
KLEIN, M. N77-12916
KLEINROCK, L. N77-12771
KLEMETTI, W. I. N77-12623
KLEMM, F. N77-12641
KLUSMAN, R. W. N77-12582
KNAPP, C. H. N77-12834
KNOKE, G. S. N77-12074
KNOTT, J. F. N77-12190
KNOX, B. E. N77-12411
KOBAYASHI, A. S. N77-12454
KOBAYASHI, H. S. N77-12248
KOCH, K. E. N77-12041
KODIS, R. N77-12035
KOFSKEY, M. G. N77-12000
KOHL, J. N77-12547
KOHNEN, E. N77-12056
KOKO, F. W., JR. N77-12327
KOLTUN, M. M. N77-12893
KOMAI, K. N77-12178
KOPACZ, S. P. N77-12385
KORDISCH, H. N77-12439
KOSMAHL, H. N77-12297
KOSSEY, P. A. N77-12623
KOURILO, J. N77-12994
KOVALENKO, A. P. N77-12362
KOWALSKI, B. R. N77-12169
KRAUS, L. A. N77-12835
KRAUSS, L. N77-12914
KRISTENSEN, L. N77-12642
KROENER, E. N77-12438
KUENTZMAN, P. N77-12353
KUGAENKO, B. V. N77-12118
KULKARNI, S. V. N77-12133
KULLBACK, J. H. N77-12751
KUNG, J. T. N77-12039
KUNKEL, B. A. N77-12648
KUNZELMANN, S. N77-12439
KUROKAWA, K. N77-12434
KYLE, R. N77-12323

L

LACOUME, J. L. N77-12614
LADO-BORDOWSKI, O. N77-12615
LAGO, B. N77-12096
LAKE, C. N77-12601
LALLI, V. R. N77-12423
LANGE, E. N77-12992
LANGOT, M. N77-11976
LAPTCHINSKY, V. F. N77-12085

LARSON, P. A. N77-12148
LASOTA, A. N77-12792
LAW, C. C. N77-12193
LAWSON, C. L. N77-12788
LAWSON, D. D. N77-12220
LEADER, E. N77-12842
N77-12843
LEADON, R. E. N77-12257
LEAKE, R. J. N77-12058
LEBUS, J. W. N77-12313
LEE, B. L. N77-12141
LEE, D. T. N77-12747
LEE, L. C. N77-12857
LEE, M. N77-12389
LEE, Y. C. N77-12878
LEES, M. A. N77-12579
LEFTIN, M. N77-12268
LEHMAN, G. M. N77-12039
LEITER, E. N77-12003
LENETT, S. D. N77-12248
LENOX, T. G. N77-12061
LENTH, R. V. N77-12814
LEONARD, C. N77-12317
LEONARD, J. T. N77-12232
LEVIN, M. N77-12841
LEVY, R. N77-12509
LEWIS, E. A. N77-12623
LEWIS, W. J. N77-12149
LEYERLE, R. W. N77-12529
LI, C. T. N77-12084
LIDMAN, W. G. N77-12198
LILLEY, R. W. N77-12029
N77-12030
LILLY, D. A. N77-12868
LINDBERG, D. A. B. N77-12732
LINDEBLAD, J. R. N77-12034
LINDMAYER, J. N77-12548
LINDQUIST, E. R. N77-12044
LINDSEY, J. F., III N77-12238
LINHARES, A. B. N77-12953
LINIGER, W. N77-12810
LIPTON, R. J. N77-12748
LIU, A. K. N77-12326
LIU, C. H. N77-11989
LIU, Y. L. N77-12290
LOEHMAN, R. E. N77-12221
LOENTAL, D. G. N77-12705
LOFGREN, G. R. N77-12647
LONDON, G. J. N77-12198
LONG, L. S., III N77-12829
LONGMIRE, C. L. N77-12624
LOPEZ-RIOS, T. N77-12162
LOPRESTI, L. N77-12769
LOSS, F. J. N77-12461
LOU, D. N77-12372
LOUISNARD, N. N77-12615
LOVELESS, F. M. N77-12101
LOVSTUHAGEN, K. N77-12482
LOWE, T. J. N77-12770
LOWELL, C. E. N77-12184
LU, C. S. N77-12851
LUCKL, L. N77-12477
LUDERS, G. N77-12112
LUDWIG, J. E. N77-12050
LUEDKE, E. E. N77-12182
LUEKER, G. S. N77-12742
LUND, D. L. N77-12365
LURKER, P. A. N77-12233
LUSHTAK, A. S. N77-12924

M

MA, F. S. T. N77-12504
MACBAIN, J. C. N77-12446
MACDONALD, R. B. N77-12480
MACELROY, R. D. N77-12718
MACIOLEK, R. B. N77-12513
MACKENZIE, E. M. N77-12617
N77-12649
MACKIE, R. R. N77-12689
MADDOX, R. L. N77-12858
MAESTRINI, M. N77-12298
MAIANI, L. N77-12560
MALIK, D. J. N77-12785
MALIK, I. A. N77-12348
MALL, S. N77-12454
MALLON, C. E. N77-12257
MALYSHEV, V. S. N77-12360
MANASEVIT, H. M. N77-12516
MANDELL, R. L. N77-12774
MANDL, G. N77-12671
N77-12672
N77-12673
MANN, J. E. N77-12226
MANOLY, A. E. N77-12308
MANTAY, W. R. N77-11999
MAPLEY, S. R. N77-12426
MARIC, V. N77-12791
MARINKAS, P. L. N77-12850
MARKVOORT, J. A. N77-12877
MARRA, P. J. N77-12039
MARSH, H. N77-12015
MARTEN, A. N77-12615
MARTIGNONI, P. N77-12235
MARTIN, F. N77-11985
MARVIN, J. G. N77-11982
MARX, E. N77-12728
MARZ, J. L. N77-12467
MASON, W. H. N77-12707
MASTRYUKOV, B. S. N77-12328
MASUYA, G. N77-12336
MATCHETT, G. A. N77-12112
MATHIEU, D. N77-12299
MATHIEU, G. N77-12833
MATSUSHITA, T. N77-12330
MATTHEYSES, R. M. N77-12719
MAWHIN, J. N77-12793
MAYHEAD, G. J. N77-12437
MAYNARD, E. E. N77-11972
MCCAULEY, M. E. N77-12689
MCCOMISH, W. C. N77-12258
MCCONVILLE, J. T. N77-12699
MCCORKLE, J. W. N77-12256
MCDAVID, W. D. N77-12855
MCDEVITT, N. T. N77-12200
MCDONALD, D. D. N77-12927
MCDOUGALL, K. B. N77-12647
MCELFRESH, T. W. N77-12622
MCELREATH, K. W. N77-12703
MCELWEE, D. A. N77-12379
MCFARLANE, R. N77-12372
MCGARRY, F. J. N77-12141
MCGINNESS, H. N77-12509
MCHENRY, H. I. N77-12203
MCINTYRE, D. N77-12228
MCKAIN, T. F. N77-12017
MCLAUGHLIN, P. V., JR. N77-12133
MCLEMORE, H. C. N77-11997
N77-12065
MCLYMAN, W. T. N77-12292
MCNEIL, R. J. N77-12688
MCQUIE, R. N77-12028
MCSWEENEY, A. N77-12599
MCWHORTER, A. L. N77-12901
MEHNE, L. F. N77-12890
MEINECKE, E. A. N77-12228
MELHORN, W. N. N77-12940
MELKANOFF, M. N77-12771
MENARD, M. N77-11976
MENDOZA, G. A. N77-12817
MEREDITH, D. D. N77-12584
MERKULOV, I. A. N77-12080
MERSOV, G. A. N77-12118
METCALF, D. R. N77-12875
METHENY, T. M. N77-12459
METHENY, W. W. N77-12853
METZGER, G. E. N77-12419
MEVERS, G. E. N77-12280
MEZEY, E. J. N77-12231
MEZHENNYI, Y. O. N77-12174
MIER, M., RAFAEL N77-12846
MIERKE, G. N77-12186
MILLAR, D. A. J. N77-12016
MILLARD, J. J. N77-12474
MILLER, A. E. N77-12913
MILLER, B. A. N77-11991
MILLER, B. P. N77-12476
MILLER, D. R. N77-12520
MILLER, J. M. N77-12033
MILLER, W. L. N77-12940
MINA, E. S. N77-12880
MINDEN, M. L. N77-12765
MINKOWSKI, J. M. N77-12285
MINKUS, C. N77-12387
MIRTICH, M. J. N77-12121
MITCHELL, C. E. N77-12158
MITCHELL, J. L. N77-12363
MITCHELL, R. A. N77-12455
MITTER, S. K. N77-12779
MIZRAHI, M. M. N77-12917
N77-12918
MOACANIN, J. N77-12220
MOEN, G. C. N77-12066
MOFFETT, L. H. N77-12741
MOFFITT, T. P. N77-12059
MOHR, R. K. N77-12229
MOMMESSIN N77-12408
MONROE, R. L. N77-12324
MOORE, E. L. N77-12245
MOORE, J. A. N77-12309
MOORE, N. R. N77-12543
MOORE, R. C. N77-12750
MOORE, R. E. N77-12669
MOORE, T. K. N77-12048
MOORE, V. S. N77-12054
N77-12139
MORDFIN, L. N77-12224
MORELL, D. N77-12561
MORGAN, T. R. N77-12073
MORRELL, G. O., JR. N77-12839
MORRISON, A. D. N77-12515
MORT, K. W. N77-11993
MORTIMER, R. W. N77-12135
MORTON, T. E. N77-12746
MORWAY, P. E. N77-12710
MOSELEY, J. T. N77-12163
MOSHKIN, Y. K. N77-12080
N77-12122
N77-12350
MOSNIER, F. P. N77-12371
MOSTYN, R. A.
MOTTO, H. L. N77-12594
MOUDY, L. A. N77-12516
MOWRY, B. A. N77-12593
MOYA, F. N77-12160
MOYNIHAN, C. T. N77-12229
MUCHA, E. I. N77-12075
MUI, J. Y. P. N77-12514
MUKAMMAL, E. I. N77-12559
MUKHERJEE, D. K. N77-12021
MULLER, C. N77-12615
MULLINIX, B. R. N77-12142
MUNN, M. W. N77-12391
MUNTZ, R. R. N77-12771
MURFREE, J. A. N77-12235
MYERS, D. N77-12478
MYERS, J. R. N77-12191
MYERS, W. N. N77-12402

N

NABER, J. A. N77-12257
NAGDA, N. L. N77-12558
NAGHDI, P. M. N77-12915
NAIR, S. N77-12452
NAMKOONG, D. N77-12518
N77-12521
NANDY, K. N77-12957
NATAHARTAKA, A. W. N77-12265
NAZAROV, G. A. N77-12082
NEAL, B. F. N77-12443
NEALE, D. H. N77-12128
NEBENZAHL, I. N77-12841
NELSON, C. N77-12567
NELSON, L. D. N77-12513
NELSON, T. J. N77-12230
NERKERVIS, R. J. N77-12501
NERNEY, B. E. N77-12707
NESS, M. N77-12664
NETTER, G. N77-12002
NEUGEBAUER, G. N77-12361
NEWKIRK, H. W. N77-12506
NICCOLLS, E. H. N77-12189
NICHOLAS, T. N77-12209
NINO, V. N77-12691
NIXON, D. N77-12335
NORMAN, J. W. N77-12704
NORTH, R. J. N77-11970
NORWITZ, G. N77-12234
NOTARGIACOMO, F. N77-12682
NUTTALL, A. H. N77-12756

O

ODONNELL, P. N77-12522
OHANLON, J. F. N77-12689
OJHA, S. K. N77-12334
OKEEFE, J. D. N77-12987
OKHOTIN, A. S. N77-12085
OLDHAM, G. A. N77-17447
OLIVA, S. A. N77-12667
OLIVER, D. A. N77-12019
OLOFF, C. M. N77-12691
OLSON, A. P. N77-12129
OLSON, C. L. N77-12946
OMEARA, T. R. N77-12870
ONEIL, E. F. N77-12462
ORRELL, M. G. N77-12825
ORTWERTH, P. J. N77-12074
OSTROVSKII, Y. I. N77-12176
OTTO, G. H. N77-12183
OTTO, R. G. N77-12391
OWEN, H. J. N77-12574

P

PADBERG, M. W. N77-12828
PAGE, J. K. N77-12640
PAGE, W. N77-12600
PAL, A. N77-12608
PALMER, R. J. N77-12039
PANDOLFI, L. N77-12775
PANG, S. H. N77-12440
PANTON, D. J. N77-12498
PAO, Y. H. N77-12864
PAQUETTE, T. E. N77-12300
PARKER, C. A. N77-12370
PARKER, D. E. N77-12690
PARKER, J. F. N77-12740
PARMERTER, R. R. N77-12460
PATEL, A. M. N77-12507
PATOV, M. I. N77-12422
PATRICK, R. P. N77-12053
PATTERSON, A. M. N77-12681
PAUL, C. R. N77-12304
N77-12305
PAUL, W. N77-12897
PAVLIN, V. N77-12428
PAYNE, P. W. N77-12838
PEAL, K. R. N77-12663
PEARCE, M. L. N77-12637
PEARSON, J. E. N77-12765
PECK, L. S. N77-12702

PEDERSEN, M. J. N77-12230
PENROSE, W. N77-12729
N77-12730
PENT, M. N77-12769
PERDRIEL, G. N77-12714
N77-12716
PERRON, R. R. N77-12954
PERRY, A. M. N77-12527
PERRY, C. H. N77-12213
PETERSON, A. A. N77-12513
PETERSON, J. R. N77-12163
PETERSON, R. A. N77-12044
PETTYJOHN, F. S. N77-12688
PFOFF, B. J. N77-12711
PHILLIPS, D. H. N77-12904
PIERCE, A. D. N77-12836
PIERCE, C. M. N77-12191
PINCUS, P. A. N77-12389
PINEGAR, F. A. N77-12050
PINKSTON, B. H. W. N77-12403
PIPES, E. B. N77-12138
PIPES, R. B. N77-12133
PIRRI, F. N77-12723
N77-12768
PIUZ, F. N77-12179
PLANTE, J. M. N77-12727
N77-12745
PLASS, G. N. N77-12665
N77-12862
PONDER, W. H. N77-12597
POOL, I. D. N77-12271
POTENZA, J. A. N77-12252
POTTER, H. R. N77-12941
POUND, G. M. N77-12898
POURING, A. A. N77-12349
PRICE, C. A. N77-12091
PRICE, K. D. N77-12765
PRILUTSKII, O. F. N77-12956
PROZZO, E. N77-12683
PUGLIANI, L. N77-12683
PURDY, D. M. N77-12039
PURSLEY, M. B. N77-12116
PURVES, N. B. N77-12039
PUSHKAREV, B. S. N77-12952
PUTMAN, W. F. N77-12040
PYKE, C. B. N77-12651
PYNE, E. J. N77-11973

R

RAAB, T. J. N77-12226
RADER, P. N77-12113
RADKIEWICZ, R. J. N77-12044
RALLIS, C. J. N77-12405
RAMER, O. G. N77-12884
RAMINS, P. N77-12297
RAMIREZ, J. E. N77-12607
RAMOS, T. J. N77-12322
RANKIN, J. P. N77-12310
RANLET, J. N77-12106
RAO, A. R. N77-12939
RAO, C. V. H. N77-12515
RAO, G. R. N77-12221
RAPPAPORT, A. N77-12576
RASMUSSEN, J. E. N77-12623
RASMUSSEN, L. N77-12642
RAST, G. J., JR. N77-12282
RASTOGI, A. N77-12882
RATLIFF, H. D. N77-12770
RAUCH, H. E. N77-12467
RAUSHENBAKH, S. V. N77-12080
RAVI, K. V. N77-12515
RAWLINS, C. B. N77-12318
READER, J. N77-12844
REDDISH, A. N77-12251
REDDY, P. B. N77-12789
REES, R. L. N77-12041
REILLY, J. N77-12585
REIMER, D. N. N77-12594
REIMNITZ, E. N77-12473
REINECKE, A. J. N77-12427
REINISCH, B. W. N77-12630
REISSNER, E. N77-12452
N77-12453
REISTER, D. B. N77-12527
RENARD, F. M. N77-12848
RESTAINO, J. M. N77-12450
REUBUSH, D. E. N77-11998
RHODES, M. D. N77-12134
RHYNE, R. H. N77-12610
RICCO, E. N77-12603
RICCOBELLO, C. N77-12682
RICE, R. F. N77-12240
RICH, R. P. N77-12731
RICH, T. P. N77-12463
RICHARDSON, D. J. N77-12046
RIETHMULLER, M. N77-12356
RILEY, J. P. N77-12596
RIMPEL, G. N77-12161
RINAUDO, R. F. N77-12316
RISICA, S. N77-12991
RITCHIE, R. H. N77-12902
RITTWAGEN, H. N77-12914
RITZ, L. A. N77-12690
RIVENES, I. J., III N77-12694
ROBBINS, W. L. N77-12874
ROBINSON, A. T. N77-12124
ROBISON, M. G. N77-12230
RODERER, N. K. N77-12927
RODGERS, T. J. N77-12303
RODRIGUE, G. P. N77-12283
RODRIGUEZ-TORRES, C. N77-12374
RODRIGUEZ, R. N. N77-12803
ROHLIK, H. E. N77-12059
ROLLINS, J. S. N77-12226
ROLPH, R. N77-12679
ROPEK, G. N77-12771
ROPER, R. G. N77-12653
ROSATI, A. N77-12685
ROSCHKE, E. J. N77-12220
ROSENBERG, H. M. N77-12143
ROSENBLATT, M. N77-12448
ROSENBLUM, M. N77-12199
ROSENTHAL, R. N77-12773
ROSS, A. J. N77-12067
ROSSIGNOL, S. N77-12677
ROTTA, J. C. N77-12339
ROTTINGHOUS, G. E. N77-12563
ROTTY, R. M. N77-12527
ROUSE, W. B. N77-12695
ROUX, J. A. N77-12237
ROWAN, J. N77-12601
ROYAL, J. W. N77-12689
RUDINGER, G. N77-12352
N77-12357
N77-12396
RUDISILL, J. E. N77-12323
RUDY, T. N77-12094
RUIZ, J. L. S. N77-12584
RUMER, R. R., JR. N77-12749
RUSTON, H. N77-12516
RUTH, R. P. N77-12729
RUTHLING, C. N77-12730
N77-12920
RUTZ, S. F. N77-12499
RUUD, C. O. N77-12250
RYDAHL, O. N77-12922
RYZHIKH, Y. P. N77-12923

S

SABAROFF, S. N77-12247
SADLER, J. C. N77-12656
SAFF, E. B. N77-12805
SAGAN, C. N77-12988
SAIN, M. K. N77-12058
SAIN, W. H. N77-12316
SALMER, R. N77-12317
SALVADORI, P. N77-12072
N77-12683
SAMSON, C. A. N77-12266
SANDERSON, B. T. N77-12202
SANTULLANO, G. A. N77-12095
SARKAR, T. K. N77-12274
SATTERTHWAIT, D. F. N77-12604
SAUSENG, O. N77-12315
SAVAGE, M. N77-12403
SAWATZKY, D. L. N77-12758
N77-12760
SCHANTZ, R. N77-12766
SCHARF, L. L. N77-12819
SCHETZ, J. A. N77-12337
SCHLADITZ, H. J. N77-12219
SCHMERLING, E. R. N77-12990
SCHMIDT, D. W. N77-12832
SCHMIDT, W. N77-11984
SCHMITZ, F. H. N77-12060
SCHNAKENBERG, G. H. N77-12565
SCHNEIDER, H. N77-12789
SCHNEIDER, L. W. N77-12702
SCHNEIDER, R. L. N77-12049
SCHROEDER, L. C. N77-12363
SCHUH, R. N77-12517
SCHULLER, T. L. N77-12513
SCHULTZ, L. A. N77-12572
SCHULZ, M. N77-12989
SCHWARTZ, M. N77-12212
SCHWARZ, F. C. N77-12306
SCHWER, L. N77-12686
SCIABARRASI, J. E. N77-12112
SCLAR, N. N77-12858
SCOTT, D. W. N77-12816
SCOTT, M. W. N77-12513
SCOTT, W. W. N77-12772
SEARCY, J. L. N77-12755
SEARS, W. R. N77-11974
SELLERS, D. R. N77-12691
SEM-JACOBSEN, C. W. N77-12692
SENICHKIN, A. P. N77-12174
SERAPHIN, B. O. N77-12538
SEROTSKY, G. N77-12050
SERPER, A. N77-12568
SEVASTYANOV, V. I. N77-12082
SEVON, W. W., JR. N77-12038
SHANKER, R. J. N77-12812
SHARMA, S. K. N77-12465
SHARPE, C. R. N77-12673
SHARPE, W. N., JR. N77-12367
SHARPSTEEN, J. T. N77-12365
SHATZ, D. J. N77-12647
SHAYMARDANOV, M. Z. N77-12923
SHCHETINKOV, Y. S. N77-12080
SHCHIPANOVA, L. P. N77-12922
SHERMAN, W. L. N77-12032
SHERWOOD, J. A. N77-12647
SHIRLAND, F. A. N77-12553
SHIVERS, J. P. N77-11997
N77-12065
SHONIN, G. S. N77-12085
SHOOMAN, M. L. N77-12749
SHOPE, F. L. N77-12076
SHRESTA, B. N77-12994
SHUTTE, N. M. N77-12611
SICHEL, M. N77-12340
SIDWELL, K. N77-11992
SIEVERDING, C. N77-12025
SILVENT, A. N77-12299
SIMBUERGER, A. N77-12431
SIMMONS, A. J. N77-12302
SIMMONS, C. J. N77-12325
SIMMONS, J. H. N77-12325
SIMMONS, R. R. N77-12579
SIMON, A. J. N77-12553
SIMPSON, W. I. N77-12516
SIMS, C. E. G. N77-12249
SIMUNOVIC, S. N. N77-12410
SINGER, A. N77-12285
SINGH, S. N77-12231
SIRMALIS, J. E. N77-12227
SKAKOV, Y. A. N77-12174
SKINNER, G. L. N77-12043
SKLAREW, R. C. N77-12589
SKORPIK, J. R. N77-12425
SKURIDIN, G. A. N77-12082
SLAGHMUYLDERS, E. N77-12100
SLEPICKA, K. L. N77-12739
SLETTEN, E. N77-12295
N77-12296
N77-12366
SLIEMERS, F. A. N77-12524
SLOOFF, J. W. N77-11979
SMALL, W. J. N77-11994
SMITH, D. N77-12266
SMITH, D. G. N77-12142
SMITH, E. K. N77-12269
SMITH, J. H. N77-12889
SMITH, K. S. N77-12624
SMITH, R. B. N77-12801
SMITH, S. N77-12630
SMITH, T. N77-12346
SMRIGLIO, F. N77-12957
SNEE, R. K. N77-12416
SNYDER, R. G. N77-12702
SOCHIVKO, A. A. N77-12404
SOKOLSKIY, V. N. N77-12080
N77-12081
SOLHEIM, C. D. N77-12365
SOLOMON, H. N77-12809
N77-12823
SOLOMON, J. S. N77-12200
SOMMER, E. N77-12439
SOOHOO, J. N77-12280
SORENSEN, N. E. N77-12069
SOUNDALGEKAR, V. M. N77-12876
SPALVINS, T. N77-12236
SPECK, C. E. N77-12423
SPELLMAN, D. L. N77-12443
SPENCER, H. W., III N77-12595
SPENCER, T. M. N77-12098
SPEZIALE, C. G. N77-12140
SPINHIRNE, J. M. N77-12358
SPOONER, J. A. N77-12939
SRNA, R. F. N77-12600
STAMPER, J. A. N77-12881
STANEWSKY, E. N77-12002
STARK, Y. S. N77-12173
STARNES, J. H., JR. N77-12134
STECHER, R. N77-12830
STEELE, R. V. N77-12533
N77-12534
STELLA, P. N77-12539
STELLHORN, W. H. N77-12736
STEPHEN, L. A. N77-12333
STEPHENS, M. A. N77-12808
N77-12809
N77-12823
STEPHENS, W. B. N77-12436
STEPKA, F. S. N77-12059
STERLING, H. J., JR. N77-12938
STERN, R. D. N77-12597
STETSON, A. R. N77-12054
N77-12139
STEVENS, D. W. N77-12647
STEVENS, G. H. N77-12517
STEVENS, L. L. N77-12312
STEVENS, R. T. N77-12287
STEVIE, R. N77-12948
STILES, P. J. N77-12909
STILLMAN, A. W., JR. N77-12698
STIRN, R. J. N77-12550
STOAP, L. J. N77-12365
STOCK, H. W. N77-11984
STOEY, W. J. N77-12283
STOKES, T. V. N77-12375

STORK, R. L. N77-12073
STRAHLE, W. C. N77-12128
STRAIT, B. J. N77-12274
STRATTON, F. W. N77-12459
STRAUGHAN, D. N77-12581
STRENZWILK, D. F. N77-12912
STRONG, P. F. N77-12954
STUART, D. M., JR. N77-12008
STUFF, R. N77-12616
SU, C. G. N77-12471
SUDDENDORF, R. F. N77-12150
SUMI, S. N77-12433
SUMMERS, R. B. N77-12374
SUMNER, I. E. N77-12099
SUN, C. T. N77-12445
SUNSHINE, C. A. N77-12254
SUREK, T. N77-12515
SUSANNA, A. N77-12683
SUTHERLAND, R. I. N77-12316
SWANSON, G. C. N77-12152
SWANSON, J. L. N77-12954
SWATTON, S. N77-12052
SWEENEY, J. L. N77-12930
SWIGERT, C. J. N77-12870

T

TAAGHOLT, J. N77-12642
TAKAMATSU, K. N77-12072
TAKHAR, H. S. N77-12876
TARR, R. C. N77-12043
TAUC, J. N77-12909
TENNANT, R. A. N77-12074
TEWARI, S. N. N77-12185
TEYFEL, V. G. N77-12986
THIAVILLE, J. M. N77-12014
THOMAS, C. L. N77-12042
THOMAS, G. L. N77-12474
THOMAS, J. N77-12056
THOMAS, R. N77-12766
THOMPKINS, W. T., JR. N77-12019
THOMPSON, K. P. N77-12751
THORNTON, C. L. N77-12115
THORNTON, P. N77-12208
THORPE, L. A. N77-12733
THURLOW, V. S. N77-12945
TIBERIO, R. N77-12298
TICE, T. R. N77-12383
TIERNEY, J. M. N77-12573
TILLINGER, M. H. N77-12883
TIMMAN, R. N77-12778
TIMOTHY, A. F. N77-12990
TIPPET, J. C. N77-12376
TOIMIL, L. J. N77-12473
TOLLIOS, C. D. N77-12663
TOUKDARIAN, R. Z. N77-12244
TOWNSEND, T. E. N77-12758
N77-12760
TRACY, P. G. N77-12463
TRAINOR, D. N77-12400
TREDICI, T. J. N77-12708
N77-12712
TRYGG, G. N77-12948
TSAKONAS, S. N77-12011
TSAY, Y. T. N77-12320
TSCHERNING, C. C. N77-12626
TSENG, D. Y. N77-12870
TUBBS, R. L. N77-12690
TUCK, A. N. N77-11970
TUNG, C. J. N77-12902
TUNNEY, A. A. N77-12165
TURMAN, B. N. N77-12621
TURNER, S. R. M. N77-12854
TYE, R. P. N77-12510

U

ULABY, F. T. N77-12243
ULFERS, H. N77-12753
URIELI, I. N77-12405
USHER, L. H. N77-12333

V

VANDENBROEK, P. P. N77-12100
VANTASSEL, P. F. N77-12764
VANWYK, J. W. N77-12420
VARAD, R. N77-12258
VARGA, R. S. N77-12805
VARGAS, R. N77-12074
VASWANI, N. K. N77-12456
VASYLIUNAS, V. M. N77-12613
VAUCHERET, X. N77-11978
VAUGHAN, J. R. M. N77-12757
VAYSSAIRE, J. C. N77-11976
VEDAM, K. N77-12411
VERDECCHIA, A. N77-12724
VESCIAL, F. N77-12390
VIG, J. R. N77-12313
VILLARREAL, S. N77-12248
VINNIKOVA, A. N. N77-12856
VINOKUR, M. N77-12955
VOGLER, R. D. N77-11968
N77-11995
VOLLMERS, H. N77-12339
VONDERDECKEN, J. N77-11981
VONLEHMDEN, D. J. N77-12567
VOROBEV, V. P. N77-12176
VORONKOV, Y. S. N77-12080
VREELAND, T., JR. N77-12907

W

WAGMAN, D. D. N77-12633
WAGNER, J. N77-12372
WAGNER, O. N77-11990
WAGNER, R. E. N77-12852
WALDEN, R. S. N77-12695
WALDMANN, J. N77-12212
WALL, M. N77-12729
N77-12730
WALTON, A. J. N77-12409
WALTON, B. L. N77-12533
N77-12534
WALZ, E. H. N77-12063
WANDZURA, S. N77-12870
WANG, C. S. N77-12910
WANG, J. Y. H. N77-12781
WANG, K. L. N77-12502
WAPNER, M. N77-12246
WARD, R. S. N77-12569
WARGO, L. J. N77-12107
WARMBROD, W. M. N77-12237
WARREN, C. N77-12271
WATASE, Y. N77-12178
WATERMAN, R. J. N77-12763
WEAVER, L. K. N77-12500
WEBER, B. A. N77-12078
WEIDNER, J. P. N77-11994
WEIMER, C. D. N77-12931
WEISENBERG, I. J. N77-12580
WEISS, D. L. N77-12009
WELIACHEW, L. N77-12985
WELLCK, R. E. N77-12637
N77-12654
WELLS, W. N77-12391
WELSH, L. B. N77-12529
WERETA, A., JR. N77-12222
WERNER, M. W. N77-12361
WEST, M. H. N77-12172
WESTINE, P. S. N77-12466
WEYER, H. B. N77-12023
N77-12024
WHELAN, C. N77-12911
WHELAN, L. A. N77-12629
WHITE, K. O. N77-12386
WHITE, M. F. N77-12437
WHITE, R. G. N77-12369
N77-12437
WHITELY, S. L. N77-12767
WHITING-OKEEFE, P. N77-12926
WHITT, W. D. N77-12070
WICKERSHAM, C. E. N77-12895
WIEGAND, W. A. N77-12666
WILDER, J. A. N77-12229
WILDMAN, R. B. N77-12563
WILDMAN, W. C. N77-12563
WILEY, R. W. N77-12704
N77-12715
N77-12860
WILHELMI, G. J. N77-12401
WILLIAMS, G. M. N77-11968
WILLIAMS, J. G. N77-12134
WILLINGHAM, W. T. N77-12577
WILSON, D. L. N77-12586
WILSON, E. E. N77-12659
WILSON, J. C. N77-12589
WILSON, W. W. N77-12128
WINCHESTER, S. N77-12945
WINDSOR, E. P. L. N77-12087
N77-12088
N77-12089
N77-12090
WINTER, C. L. N77-12647
WISE, H. F. N77-12561
WISEMAN, M. A. N77-12647
WISINSKI, L. J. N77-12230
WISWALL, C. E. N77-12393
WITWER, J. G. N77-12528
WOETMANNNIELSEN, N. N77-12642
WOHLERS, C. C. N77-12151
WOLF, S. W. D. N77-11975
WOLNER, H. A. N77-12513
WOMACK, B. F. N77-12777
WONG, W. N77-12736
WOOD, A. D. N77-12391
WOOD, D. J. N77-12938
WOOD, D. L. N77-12690
WOOD, D. S. N77-12907
WOODSTROM, J. H. N77-12443
WOOLLEY, R. M. N77-12455
WORLEY, R. E. N77-12459
WORRALL, K. J. N77-12369
WORTHINGTON, T. N77-12413
WRAY, D. N77-12842
WRAY, W. O. N77-12192
WU, S. T. N77-12638
WUEST, W. N77-12354
WYLIE, C. D. N77-12689

Y

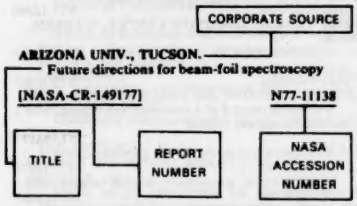
YAGGY, L. S. N77-12301
YAHAN, J. N77-12822
YAN, T. Y. N77-12288
YANG, J. J. N77-12516
YANG, S. M. N77-12762
YATES, J. E. N77-12012
N77-12342
YATES, R. E. N77-12320
YEAGER, W. T., JR. N77-11999
YEDINAK, P. D. N77-12912
YEE, Y. P. N77-12655
YEH, Y. C. M. N77-12550
YEN, H. W. N77-12384
YENNI, K. R. N77-12066
YOON, C. S. N77-12738
YOUNG, J. M. N77-12759
YOUNG, L. R. N77-12678
YUNG, S. N77-12601

Z

ZABLOCKI, R. N77-12926
ZAK, J. N77-12905
ZALCMANN, A. N77-12212
ZHEVAKIN, S. A. N77-12242
ZIEGLER, L. N77-12125
ZINK, R. A. N77-12533
N77-12534
ZINSMEISTER, G. N77-12899
ZOOK, J. D. N77-12513
ZUBOV, V. V. N77-12328
ZUPAN, J. M. N77-12952
ZURKO, M. J. N77-12417
ZVONKOV, S. D. N77-12173
ZWAKENBERG, R. G. N77-12722
ZWILLENBERG, M. L. N77-12380

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ABCOR, INC., CAMBRIDGE, MASS.
Growth effects of major land use projects. Volume 3: Summary
[PB-256204/9] N77-12583

ACADEMY OF SCIENCES [USSR], MOSCOW.
Some results of studies in space technology in the USSR
[D-240] N77-12085
Energy spectra of electrons with energies 3 keV probably accelerated in onteraction of the injected electron beam with the ionospheric plasma in Araks experiment
[D-222] N77-12611
The cold plasma throughout the magnetosphere
[D-230] N77-12612
Search of invisible supernovae
[D-236] N77-12956

ADAPTRONICS, INC., MCLEAN, VA.
Controllers and autopilot modes for RPV simulation program
[AD-A025792] N77-12051

ADMIRALTY MATERIALS LAB., POOLE [ENGLAND].
Spectral sensitivity calibration of spectrophotometers
[AML-R7602] N77-12370

ADVANCED TECHNOLOGY LABS., INC., WESTBURY, N.Y.
Ignition phase blast field of tube or silo launched rockets: Inviscid, chemically reacting flow model
[AD-A025198] N77-12106

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS [FRANCE].
Numerical methods and windtunnel testing
[AGARD-CP-210] N77-11969
Through-flow calculations in axial turbomachinery
[AGARD-CP-195] N77-12013
Flow of solid particles in gases
[AGARD-AG-222] N77-12352
Visual aids and eye protection for the aviator
[AGARD-CP-191] N77-12708

AEL SERVICE CORP., FARMINGDALE, N.J.
Electromagnetic radiation system [EMRS] for susceptibility testing
[AD-A025243] N77-12259

AERONAUTICAL RESEARCH ASSOCIATES OF PRINCETON, INC., N.J.
User's manual: Supersonic unsteady cascade program, volume 2
[AD-A025186] N77-12012
Analysis of supersonic unsteady cascades with the method of characteristics, volume I
[AD-A025909] N77-12342

AERONUTRONIC FORD CORP., HOUSTON, TEX.
Field spectrometer [S191H] preprocessor tape quality test program design document
[NASA-CR-151110] N77-12364

AEROSPACE CORP., EL SEGUNDO, CALIF.
On-orbit and in-plant satellite storage
[AD-A025902] N77-12105
The generalized trajectory simulation system. Volume 4: Numerical operators
[AD-A025436] N77-12755
Absorptance calculations for a multilayer absorbing stack: Application to thin film photoconductor assemblies
[AD-A025798] N77-12868
Personal rapid transit research conducted at the Aerospace Corporation
[PB-256846/7] N77-12946
Charged-particle absorption by Io
[NASA-CR-149162] N77-12989

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Catalytic deoxygenation of aqueous solution by hydrazine
[AD-A025794] N77-12233
An algorithm for the analysis of reconnaissance imagery
[AD-A025964] N77-12487
Effects of acceleration on selected serum enzymes
[AD-A025965] N77-12691
Test plot evaluation of a reclined cockpit seat as an aid to G tolerance and performance
[AD-A025784] N77-12703

AGENCE TUNISIENNE DE PUBLIC-RELATIONS, TUNIS.
Max Valier: A pioneer of space travel
[NASA-TT-F-664] N77-12993

AGNEW TECH-TRAN, INC., WOODLAND HILLS, CALIF.
Influence of air humidity on compressor and turbine efficiency determined from experimental data
[NASA-TT-F-17073] N77-12057

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.
Optimum support damping for a vibrating beam
[AD-A025106] N77-12446
Solar cell observables reduction techniques
[AD-A025923] N77-12541

AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Photographic emulsion threshold functions study
[AD-A025471] N77-12374

AIR FORCE CAMBRIDGE RESEARCH LABS., L. G. HANSCOM FIELD, MASS.
Low frequency wave-reflection properties of the equatorial ionosphere
[AD-A025111] N77-12623
Heat and thrust requirements of a thermal fog dispersal system
[AD-A025112] N77-12648

AIR FORCE CIVIL ENGINEERING CENTER, TYNDALL AFB, FLA.
Vapor phase spectra for air pollution studies
[AD-A025156] N77-12603

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
F-111a wing fatigue test program
[AD-A025795] N77-12049

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Conceptual study of a low cost turbojet engine
[AD-A025652] N77-12062
Parametric analysis of laser target designators for airborne applications
[AD-A025659] N77-12397
An investigation of the degradation of a laser beam by high intensity turbulence
[AD-A025658] N77-12398

AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO.
Environmental effects on maintenance costs for aircraft equipment
[AD-A025801] N77-12048
Surface characterization of titanium and titanium alloy. Part 1: Effect on titanium-6 aluminum-4 vanadium alloy of commercial treatments
[AD-A025334] N77-12188
Hardening characteristics of TI-6AL-2SN-4ZR-6MO alloy
[AD-A025307] N77-12191
The influence of heat treatment on the structure and properties of an isothermally forged Ti6-Al-6V-2Sn nose wheel and structural shape
[AD-A025473] N77-12195
Surface analysis of 6061 and 7050 aluminum alloys after conditioning by chemical treatment
[AD-A025736] N77-12200
Effects of iron and silicon content on stress corrosion cracking in a thermomechanically processed aluminum alloy
[AD-A025165] N77-12210
Preliminary evaluation of ATQ polymer as a potential matrix resin
[AD-A025897] N77-12222
Hot pressure welding of aluminum alloys
[AD-A025966] N77-12419
Scanning electron microscopy, ion scattering and secondary ion mass spectrometry to characterize apparent adhesive failure in an adhesive bond
[AD-A025615] N77-12442

AIR FORCE PACKAGING EVALUATION AGENCY, WRIGHT-PATTERSON AFB, OHIO.
Outdoor evaluation: Study means of assuring MIL-D-6054 steel drums are hermetically sealed
[AD-A025809] N77-12418

AIR FORCE SYSTEMS COMMAND, BROOKS AFB, TEX.
USAF aviator classes. HGU-4/P: History and present state of development
N77-12712

AIR FORCE TECHNICAL APPLICATIONS CENTER, ALEXANDRIA, VA.
Measurement of optical power radiated by Florida lightning
[AD-A025320] N77-12621

AIR FORCE WEAPONS LAB., KIRTLAND AFB, N.MEX.
Analysis of dynamic aircraft response to bomb damage repair
[AD-A025647] N77-12047
Aircraft ionizing doses and dose rates from radioactive clouds and fallout
[AD-A024896] N77-12053
Development and application of a low cost gas dynamic laser test facility
[AD-A025648] N77-12074
Adjoint Monte Carlo generated radiation response functions for the B-1 aircraft
[AD-A025756] N77-12687
A theoretical study of the permanent and transient effects of ionizing radiation on the electrical performance of metal oxide semiconductor on sapphire inverters
[AD-A024752] N77-12904

AIR POLLUTION TECHNOLOGY, INC., SAN DIEGO, CALIF.
A. P. S. electrostatic scrubber evaluation
[PB-256335/1] N77-12601

AIRESEARCH MFG. CO., PHOENIX, ARIZ.
Transonic two-dimensional flow analysis of compressor cascade with splitter vanes
[AD-A025921] N77-12347

AKRON UNIV., OHIO.
Development of highly oriented polymers with improved mechanical properties
[AD-A024988] N77-12228

ALABAMA UNIV., HUNTSVILLE.
Low-gravity processing of superconducting compounds
[NASA-CR-150106] N77-12183
Listing of solar radiation measuring equipment and glossary
[NASA-CR-150064] N77-12507
Review study and evaluation of possible flight experiments relating to cloud physics experiments in space
[NASA-CR-150066] N77-12638

ALCOA CONDUCTOR PRODUCTS CO., MASSENA, N. Y.
High-voltage transmission conductor motion research
[PB-255768/4] N77-12318

ALUMINUM CO. OF AMERICA, ALCOA CENTER, PA.
Improvement of reliability and the mechanical properties of titanium alloy forgings
[AD-A025479] N77-12197
AMERICAN INST. OF MINING, METALLURGICAL, AND PETROLEUM ENGINEERS, INC., WASHINGTON, D. C.
Proceedings of the Mineral Economics Symposium: Winning the high stakes at the critical commodity game
[PB-255607/4] N77-12502
AMERICAN IRON AND STEEL INST., WASHINGTON, D. C.
Progress report on the corrosion behavior of selected stainless steels in soil environments
[PB-256329/4] N77-12202
ANALYTIC SCIENCES CORP., READING, MASS.
Space shuttle navigation analysis
[NASA-CR-151113] N77-12112
ANALYTICAL AND COMPUTATIONAL MATHEMATICS, ZURICH (SWITZERLAND).
Application of the multirevolution orbit prediction method
[ESA-CR(P)-840] N77-12093
APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
Maritime and construction aspects of Ocean Thermal Energy Conversion [OTEC] plant ships
[PB-255639/7] N77-12552
PDP-11 macro cross assembler
[AD-A025751] N77-12731
ARCTEC, INC., COLUMBIA, MD.
Tests of oil recovery devices in broken ice fields, phase 2
[AD-A025748] N77-12572
ARIZONA STATE UNIV., TEMPE.
Thermodynamic, structural and transport properties of some fluorite solid electrolytes
N77-12892
ARIZONA UNIV., TUCSON.
Some experiences with the exploitation of measurements of the perturbation field in a wind tunnel to improve simulation
N77-11974
Investigations into new methods of analysis by atomic and molecular fluorescence and flame emission
N77-12150
Symposium on the Fundamental Optical Properties of Solids Relevant to Solar Energy Conversion
[PB-256615/6] N77-12538
Reconstruction of past climatic variability
[AD-A024276] N77-12647
Past air-sea interactions over the eastern North Pacific Ocean as revealed by tree-ring data
N77-12660
Imagery utilizing multiple focal planes
N77-12852
Image quality through the atmosphere
N77-12853
ARKANSAS DIV. OF SOIL AND WATER RESOURCES, LITTLE ROCK.
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
ARKANSAS GEOLOGICAL COMMISSION, LITTLE ROCK.
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
ARKANSAS STATE HIGHWAY DEPT., LITTLE ROCK.
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494
ARMED FORCES RADIOBIOLOGY RESEARCH INST., BETHESDA, MD.
Microwave exposure facility: Multiple animal exposure at equal power density
[AD-A024939] N77-12667
ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, ALA.
Pilot opinion of flight displays and monitoring gauges in the UH-1 helicopter
[AD-A024714] N77-12579
Aeromedical review of oxygen requirements of US Army aviators
[AD-A024726] N77-12688
Vision with the AN/PVS-5 night vision goggle
N77-12715
In-flight evaluation of hand-held optically stabilized target acquisition devices
N77-12717
ARMY AEROMEDICAL RESEARCH UNIT, FORT RUCKER, ALA.
Lens material evaluation [goggles, sun, wind, and dust]
[AD-A025778] N77-12860
ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LAB., CLEVELAND, OHIO.
Cold-air performance of a tip turbine designed to drive a lift fan. 1: Baseline performance
[NASA-TM-X-3452] N77-12000
ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LAB., HAMPTON, VA.
Correlation of full-scale helicopter rotor performance in air with model-scale Freon data
[NASA-TN-D-8323] N77-11999
A new capability for predicting helicopter rotor noise in hover and in flight
[NASA-CR-147138] N77-12064
A parametric analysis of visual approaches for helicopters
[NASA-TN-D-8275] N77-12066
ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LAB., MOFFETT FIELD, CALIF.
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
In-flight far-field measurement of helicopter impulsive noise
[AD-A025979] N77-12060
ARMY AVIATION ENGINEERING FLIGHT ACTIVITY, EDWARDS AFB, CALIF.
Army preliminary evaluation JOH-58A helicopter with low reflective paint and infrared countermeasure exhaust system
[AD-A024727] N77-12042
Airworthiness and flight characteristics evaluation: YAH-1S improved Cobra agility and maneuverability helicopter
[AD-A025476] N77-12043
ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Effects of radiation penetration on snowmelt runoff hydrographs
[AD-A025763] N77-12489
ARMY CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, ILL.
Development of the Military Construction Data System [MCDS], part 2
[AD-A024938] N77-12736
ARMY ELECTRONICS COMMAND, FORT MONMOUTH, N.J.
UV/ozone cleaning of surfaces
[AD-A024943] N77-12313
The spectral characteristics and atmospheric CO2 absorption of the Ho[+]3: YLF laser at 2.05 micrometers
[AD-A025618] N77-12386
Error analysis of minimum information and Smith's direct methods for inverting the radiative transfer equation
[AD-A025478] N77-12865
ARMY ELECTRONICS LABS., FORT MONMOUTH, N.J.
Synoptic thermal wind calculations from radiosonde observations over the southwestern United States
[AD-A025693] N77-12655
ARMY ENGINEER TOPOGRAPHIC LABS., FORT BELVOIR, VA.
A new photogrammetric comparator design
[AD-A025977] N77-12503
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Symposium on nondestructive test and evaluation of airport pavements
[AD-A025442] N77-12444
Durability and behavior of prestressed concrete beams. Report 5: Laboratory tests of weathered pretensioned beams
[AD-A025694] N77-12462
Research and Development Management Analysis System [RDMAS]
[AD-A025447] N77-12920
ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
On the embrittlement of grain boundaries by impurities
[AD-A024940] N77-12206
A survey of fracture mechanics applications in the United States
[AD-A024715] N77-12463
ARMY MATERIEL COMMAND, TEXARKANA, TEX.
A tensile testing experiment correlating load with acoustic emission
[AD-A024813] N77-12450
A free head-movement pupillometer system
[AD-A025900] N77-12698
ARMY MISSILE COMMAND, REDSTONE ARSENAL, ALA.
Solid propellants for hydrogen gas generators
[AD-A025974] N77-12235
ARMY MISSILE RESEARCH, DEVELOPMENT AND ENGINEERING LAB., REDSTONE ARSENAL, ALA.
Investigation of jet plume effects on the longitudinal stability characteristics of a body of revolution with various fin configurations at Mach numbers from 0.2 to 2.3 [normal jet plume simulator]
[AD-A024978] N77-12006
Simulation models and baseline guidance and control for indirect-fire missiles with strapdown-inertial guidance
[AD-A024977] N77-12102
SAM-D trade-off study, Electromechanical Control Actuation System [em/CAS]
[AD-A025232] N77-12104
An assessment of the fracture resistance of three chopped-fiber reinforced phenolic materials
[AD-A024672] N77-12142
Wave analyzer dynamic range and bandwidth requirements for signal noise analysis
[AD-A024671] N77-12282
Asymmetrical oscillations in nonlinear systems
[AD-A024673] N77-12320
ARMY NIGHT VISION LAB., FORT BELVOIR, VA.
The development of thin film photodetectors for the 8-14 micrometer atmospheric window
[AD-A025984] N77-12872
ARMY RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NATICK, MASS.
Effectiveness of four water cooled undergarments and a water cooled cap in reducing heat stress
[AD-A025216] N77-12696
ARMY TANK-AUTOMOTIVE CENTER, WARREN, MICH.
A procedure for the statistical analysis of vehicular noise emission spectra for limited samples
[AD-A025981] N77-12602
ARO, INC., ARNOLD AIR FORCE STATION, TENN.
Automatic control of a transonic wind tunnel with a real-time computer system
N77-11977
A mathematical model for the starting process
[AD-A025692] N77-12076
DFVLR/AEDC cooperative thermal vacuum test 3
[AD-A024778] N77-12237
ATLANTIC RICHFIELD CO., HARVEY, ILL.
Synthesis and analysis of jet fuel from shale oil and coal syncrudes
[NASA-CR-135112] N77-12230
AUERBACH ASSOCIATES, INC., PHILADELPHIA, PA.
Disk drive interface characteristics
[PB-256440/9] N77-12737
AVCO-EVERETT RESEARCH LAB., EVERETT, MASS.
Investigation of electron impact processes relevant to visible lasers
[AD-A025005] N77-12399
Metal vapor visible laser kinetics program
[AD-A025004] N77-12400
AVIONS MARCEL DASSAULT, SAINT-CLOUD [FRANCE].
Adaptation of the Joppa method to a wind tunnel with variable permeability
N77-11976

B

BALL BROS. RESEARCH CORP., BOULDER, COLO.
Automatic magnetic control of a momentum-biased observatory in equatorial orbit
N77-12098
BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
The clustering of O2 and He to Li[+]
[AD-A025762] N77-12625
Absorption of ultrasound in organic crystals
[AD-A025174] N77-12912
BATTELLE COLUMBUS LABS., OHIO.
Effect of inclusions on the mechanical behavior of beryllium
[AD-A025968] N77-12209
Fuel contaminants. Volume 1: Chemistry
[PB-256020/9] N77-12231
Metals mining and milling process profiles with environmental aspects
[PB-256394/8] N77-12501
Review of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays
[NASA-CR-149215] N77-12524
Research, design, and development of the U.S. Coast Guard high seas oil containment system
[AD-A025749] N77-12573
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Development of sputtered high temperature coatings for thrust chambers
[NASA-CR-135097] N77-12181
Investigate feasibility of utilizing acoustic emission methods to evaluate the integrity of a prototype ADAPTS oil storage container
[AD-A025910] N77-12425
BECHTEL CORP., SAN FRANCISCO, CALIF.
Preliminary economics and comment: In-situ gasification of coal for power and SNG
[PB-256034/0] N77-12554
BECK [R. W.] AND ASSOCIATES, DENVER, COLO.
Feasibility study for a direct, air-cooled condensation system
[PB-256403/7] N77-12537
BELL HELICOPTER CO., FORT WORTH, TEX.
High-survivable transmission system
[AD-A025930] N77-12046
BOCHUM OBSERVATORY [WEST GERMANY].
Remote sensing of variations of sea-ice-surfaces in the Barents-Sea from 1966 - 1975 by means of satellite data, among others NOAA-VHRR
N77-12484
Remote sensing of geothermic activities of the volcanoes Aetna, Stromboli and Vesuv by means of infrared NOAA-VHRR-satellite data
N77-12485

BOEING AEROSPACE CO., HOUSTON, TEX.
Software sneak circuit analysis
[AD-A024718] N77-12310
BOEING AEROSPACE CO., SEATTLE, WASH.
Ceramic airframe bearings
[AD-A025142] N77-12420
Design handbook for imagery interpretation equipment
[AD-A025453] N77-12869
BOEING VERTOL CO., PHILADELPHIA, PA.
The use of computers in rotary wing testing
N77-11973
Advanced helicopter structural design investigation. Volume 1: Investigation of advanced structural component design concepts
[AD-A024662] N77-12052
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Distributed computation and TENEX-related activities
[AD-A025956] N77-12766
BONNER AND MOORE ASSOCIATES, INC., HOUSTON, TEX.
Crude supply alternatives for the Northern Tier states. Volume 1: Executive summary
[PB-255992/0] N77-12531
Crude supply alternatives for the Northern Tier states. Volume 2: Technical report
[PB-255993/8] N77-12532
BOOZ-ALLEN AND HAMILTON, INC., WASHINGTON, D.C.
Economic impact of pollution regulations on steel plants in the Mahoning River Valley
[PB-256338/5] N77-12585
BOSTON COLL., CHESTNUT HILL, MASS.
The maximum liklihood method applications to DAASM studies
[AD-A025223] N77-12258
BRANDEIS UNIV., WALTHAM, MASS.
Positron, electron and photon interaction experiments
[AD-A025482] N77-12908
BREVARD COUNTY PLANNING DEPT., TITUSVILLE, FLA.
Planning applications in east central Florida
[E77-10044] N77-12474
BRITISH AIRCRAFT CORP. [OPERATING] LTD., BRISTOL [ENGLAND].
Solar out-of-ecliptic study. Volume 1: Executive summary
[ESS/SS-699-VOL-1] N77-12087
Solar out-of-ecliptic study. Volume 2: System analysis and definition
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition
[ESS/SS-699-VOL-3] N77-12089
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091
BRITISH LIBRARY LENDING DIV., BOSTON SPA [ENGLAND].
Flow-induced vibrations resulting from Karman vortex trails
[BLL-RISLEY-TR-2994-[9091.9F]]
N77-11988
Investigation of stress corrosion of Inconel 600 and Incoloy 800 for steam generators
[BLL-RISLEY-TR-3038-[9091.9F]]
N77-12177
Precision standing comparison between remotely separated time standards
[BLL-DRIC-TRANS-4307-[3623.66]]
N77-12830
BRITISH STEEL CORP., SHEFFIELD [ENGLAND].
A comparison of practical and theoretical correction factors for use in X-ray fluorescence analysis of oxide materials
[PB-256054/8] N77-12165
The determination of trace amounts of aluminium, bismuth, chromium and antimony in steels by flameless atomic absorption spectrophotometry
[PB-256053/0] N77-12204
Determination of correction factors by regression analysis for the analysis of sulfur using optical emission spectrometry
[PB-256052/2] N77-12205
Hydraulic press: RDL Redcar
[PB-256050/6] N77-12414
Metallurgical factors controlling weld metal toughness in the seam welding of line pipe
[PB-256057/1] N77-12415
The welding of organic coated steels and laminates
[PB-256056/3] N77-12416
BROWN, BOVERI AND CO., LTD., BADEN [SWITZERLAND].
Design of turbine, using distributed or average losses; effect of blowing
N77-12021
BROWN UNIV., PROVIDENCE, R. I.
Assessment of cadmium sulfide photovoltaic arrays for large scale electric utility applications
[PB-255646/2] N77-12551
Optical studies of bonding in solids
[AD-A024949] N77-12909
BRUSH WELLMAN, INC., CLEVELAND, OHIO.
Effect of inclusions on the mechanical behavior of beryllium
[AD-A025968] N77-12209
BUREAU OF MINES, PITTSBURGH, PA.
A passive personal sampler for nitrogen dioxide
[PB-254447/6] N77-12565

C

C AND C RESEARCH, INC., DANVERS, MASS.
CPA color reversal study
[AD-A025899] N77-12373
C-E POWER SYSTEMS, WINDSOR, CONN.
Laboratory analysis of solvent refined coal
[PB-255550/6] N77-12598
CALCUTTA UNIV. [INDIA].
Investigations on ionospheric electron content and electron density irregularities at low latitudes with geostationary satellites
[AD-A024957] N77-12628
CALIFORNIA DEPT. OF TRANSPORTATION, SACRAMENTO.
California trials with Lean Concrete Base [LCB]
[PB-254035/9] N77-12443
Prestress tendons on short radius curves
[PB-256015/9] N77-12458
CALIFORNIA INST. OF TECH., PASADENA.
Support of the infrared radiometer on the ST
[NASA-CR-144818] N77-12361
Gallium arsenide - gallium alluminum arsenide distributed feedback and distributed Bragg reflector lasers
N77-12384
Surface effects on spinwave resonance in thin magnetic films
N77-12884
High velocity behavior of dislocations in copper
[AD-A025484] N77-12907
Equations of state and impact-induced shock-wave attenuation on the moon
[NASA-CR-149245] N77-12987
CALIFORNIA RESEARCH AND TECHNOLOGY, INC., WOODLAND HILLS.
Numerical analysis of fuel tank penetration dynamics
[AD-A025451] N77-12448
CALIFORNIA UNIV., BERKELEY.
Automatic multiple-sample applicator and electrophoresis apparatus
[NASA-CASE-ARC-10991-1] N77-12157
On thermodynamics and the nature of the second law. 1: Single phase continua
[AD-A025109] N77-12915
CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Flat-plate solar collector handbook. A survey of principles, technical data and evaluation results
[UCID-17086] N77-12506
California energy outlook
[UCRL-5196-REV-1] N77-12525
FENIX: The LRLTRAN compiler for the STAR
[UCID-30128] N77-12722
Another look at the concept of model
[UCRL-77896] N77-12790
CALIFORNIA UNIV., LOS ANGELES.
Results of some investigations of differential gain theory applied to air-to-air systems. Volume 2: Stochastic differential games with complexity constrained strategies for air-to-air systems
[AD-A025322] N77-12008
Moment space error bounds for digital communication systems with intersymbol interference based on nth moment
[AD-A025013] N77-12288
Theoretical analysis of ATJS graphite disks fractured by spinning
[AD-A024711] N77-12451
Paleobiology and paleoecology of middle Cambrian algae from western North America
N77-12604
Some aspects of the influence of abnormal eastern equatorial Pacific Ocean surface temperatures upon weather patterns in the southwestern United States, volume 2
[AD-A024710] N77-12651
Computer network research
[AD-A025914] N77-12771
Measurement of excitation functions for charged particle reactions with gases
N77-12875
Relativistic effects in resonance absorption
[AD-A025192] N77-12878
CALIFORNIA UNIV., SAN DIEGO.
On asymptotic expansions and error bounds in the derivation of two-dimensional shell theory
[AD-A025677] N77-12452
On stretching, bending, twisting and flexure of cylindrical shells
[AD-A025676] N77-12453
Photochemical air pollution: Weekday-weekend differences
N77-12557
Bounding the thickness of the oceanic magnetized layer
N77-12661
Toward a convergent perturbation theory
N77-12785
CALSPAN CORP., BUFFALO, N.Y.
Some experiences with the exploitation of measurements of the perturbation field in a wind tunnel to improve simulation
N77-11974
CAMBRIDGE UNIV. [ENGLAND].
Segregation effects and the toughness of high-strength steels
[AD-A025299] N77-12190
CARLETON UNIV., OTTAWA [ONTARIO].
Through-flow calculations based on matrix inversion: Loss prediction
N77-12016
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
An approach to global register allocation
[AD-A024966] N77-12735
Using strong convergence to accelerate value iteration
[AD-A025604] N77-12746
A survey of parallel algorithms in numerical linear algebra
[AD-A024792] N77-12754
Solving nearby integer programs
[AD-A025606] N77-12797
Representations of unbounded optimizations as integer programs
[AD-A025603] N77-12798
Worst-case analysis of a new heuristic for the travelling salesman problem
[AD-A025602] N77-12799
The development and Monte Carlo investigation of non-hierarchical clustering procedure, and its application to discrimination problems in industrial administration
N77-12812
Set partitioning: A survey
[AD-A025600] N77-12828
CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Roller bearing geometry design
[NASA-CR-135082] N77-12403
Design, construction and evaluation of a high pressure, high electric field optoacoustic detector
[AD-A025772] N77-12864
CATHOLIC UNIV. OF AMERICA, WASHINGTON, D.C.
Structural relaxation of enthalpy and heat capacity of As2Se3 glass
[AD-A025018] N77-12229
Investigation of piezoelectric effect in permanently polarized oxide glasses and glass-ceramics
[AD-A025144] N77-12325
Finite difference energy techniques for arbitrary meshes applied to linear and nonlinear problems with irregular domains
N77-12428
Research and development in glass technology related to fiber optic waveguides
[AD-A025660] N77-12867
CENTER FOR CALIFORNIA PUBLIC AFFAIRS, CLAREMONT.
Self-regulation of environmental quality: Impact analysis in California local government
[PB-254450/0] N77-12566
CENTER FOR NAVAL ANALYSES, ARLINGTON, VA.
On the semi-classical expansion in quantum mechanics for arbitrary Hamiltonians
[AD-A025441] N77-12917
WKB expansions by path integrals, with applications to the anharmonic oscillator
[AD-A025440] N77-12918
CENTRE DE RECHERCHES DU SERVICE DE SANTE DES ARMEES, CLAMART [FRANCE].
Experimental study of vision dimming in an animal
N77-12716
CENTRE DE RECHERCHES SCIENTIFIQUES ET TECHNIQUES DE L'INDUSTRIE DES FABRICATIONS METALLIQUES, BRUSSELS [BELGIUM].
Data processing and industrial process control. Part 3: Numerical control [level 2 functions] and economic optimization [level 3 functions]
[CRIF-IN-3] N77-12776
CENTRE NATIONAL D'ETUDES SPATIALES, PARIS [FRANCE].
French space program. Report to COSPAR
N77-12086
CENTRE PRINCIPAL D'EXPERTISES MEDICALES DU PERSONNEL NAVIGANT, PARIS [FRANCE].
Concerning flight and the correction of presbyopia
N77-12713

CHRYSLER CORP., NEW ORLEANS, LA.
Transonic stability and control characteristics of a 0.015 scale model 69-0 of the space shuttle orbiter with forebody RSI modification in the NASA/LaRC 8 foot TPT [LA72]
[NASA-CR-147644] N77-12108
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 1
[NASA-CR-147646] N77-12109
High supersonic stability and control characteristics of a 0.015-scale [remotely controlled elevon] model 44-0 space shuttle orbiter tested in the NASA/LaRC 4-foot UPWT [LEG 2] [LA75], volume 2
[NASA-CR-147647] N77-12110
A low speed wind tunnel test of a 0.050 scale model of shuttle orbiter [model 089B] to investigate the longitudinal and lateral directional effects of canard and tail configurational modifications in the LTV LSWT [MA14]
[NASA-CR-147649] N77-12111

CINCINNATI ELECTRONICS CORP., OHIO.
Equipment compliance report for AN/URC-78[XE-1]/V. Volume 4: Service condition test report
[AD-A025667] N77-12279

CINCINNATI UNIV., OHIO.
Consolidation of Beta 3 titanium alloy spherical metal powders by hot swaging
[AD-A025469] N77-12196

CITY UNIV., LONDON [ENGLAND].
A review of research in the United Kingdom in the field of multiple flows of solids and gases
N77-12355

CITY UNIV. OF NEW YORK RESEARCH FOUNDATION, N.Y.
SPHERE, a program for computing buckling loads of spherical shells under uniform pressure
[AD-A025012] N77-12467

CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N.Y.
Cumulative deflection and rigid pavement serviceability
[AD-A024969] N77-12077
Optimal scheduling of tasks on multiprocessor systems
N77-12719

CLEMSON UNIV., S.C.
An economical square-wave polarograph for electrochemical analysis
N77-12149

COAST GUARD RESEARCH AND DEVELOPMENT CENTER, GROTON, CONN.
Development of a Distress Alerting and Locating System [DALS]
[AD-A023841] N77-12034

COLORADO STATE UNIV., FORT COLLINS.
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158
Toxic heavy metals in groundwater of a portion of the front range mineral belt
[PB-256212/2] N77-12582
Stochastic approximation with correlated data
[AD-A024279] N77-12819
Laser diagnostics of laser-produced plasmas
[AD-A024936] N77-12880

COLORADO UNIV., BOULDER.
Matrix affinity chromatography and its application to the concentration and separation of trace organics in water
N77-12148
Finite least squares collocation method
N77-12782

COMPUTER SCIENCES CORP., FALLS CHURCH, VA.
Mobile terminal access to the advanced command-control architectural testbed
[AD-A025818] N77-12281
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 1: Text
[PB-256822/8] N77-12729
Experimental test concept for a cargo data interchange system [CARDIS]. Volume 2: Appendixes
[PB-256823/6] N77-12730

CONSTRUCTION ENGINEERING RESEARCH LAB. [ARMY], CHAMPAIGN, ILL.
An analytical model for uniaxial cyclic inelastic behavior of reinforced concrete
[AD-A024910] N77-12465
The feasibility of a storable propellant turbine/high-speed alternator as a compact short life power system for hardened ballistic missile defense [BMD] installations
[AD-A024786] N77-12543

CONTROL DATA CORP., MINNEAPOLIS, MINN.
Digital orthophoto study Add-On
[AD-A025690] N77-12498

CORNELL UNIV., ITHACA, N.Y.
Visible wavelength chemiluminescence initiated by CO2 laser radiation
[AD-A025002] N77-12170
Computer simulations of planetary accretion dynamics: Sensitivity to initial conditions
[NASA-CR-149214] N77-12988

CUSHING ENGINEERING, INC., NORTHBROOK, ILL.
Exploding wire shock test facility
[AD-A024924] N77-12079

D

DANISH METEOROLOGICAL INST., COPENHAGEN.
Automatic meteorological observations in Northern Greenland
[P-62] N77-12642

DARCOM INTERN TRAINING CENTER, TEXARKANA, TEX.
Applicability of spectrometric oil analysis to internal combustion engines: Initial phase of extended life test
[AD-A024743] N77-12168
A survey of computer-aided electronic circuit design programs
[AD-A024768] N77-12309
Preliminary evaluation of fatigue life gages used for beam life prediction
[AD-A024811] N77-12375
Holographic interferometer background fringe reduction by dual vacuum application
[AD-A024741] N77-12379
Aircraft tires: Balance pad bonding integrity
[AD-A024815] N77-12413
Modeling reliability and maintainability characteristics of production systems via the Markov process
[AD-A025121] N77-12426
Investigation of the effect of inspection error on sequential sampling plans
[AD-A024760] N77-12427
An empirical design procedure for shafts with fatigue loadings
[AD-A024785] N77-12457
The feasibility of solar energy usage on Red River Army Depot
[AD-A025119] N77-12535
A replacement policy for components of a pure series system utilizing one component as an indicator of replacement time
[AD-A024979] N77-12825

DATA USE AND ACCESS LABS., ARLINGTON, VA.
CENTS-AID II programmer's notebook
[PB-256475/5] N77-12761

DAYTON UNIV., OHIO.
Bonding of elevated temperature strain gages to humid aged graphite tensile specimens through the use of anaerobic adhesives
[AD-A025920] N77-12223
Numerical analysis of fuel tank penetration dynamics
[AD-A025451] N77-12448

DEFENCE RESEARCH BOARD, OTTAWA [ONTARIO].
DRB Aviation Medical Research Unit reports. Volume 5: 1974 - 1976
[DRB-DR-225] N77-12671
Neurophysiology and road safety: Contribution of the frontal lobes to visual orienting
N77-12672
Color inputs to orientation detectors in the human visual system
N77-12673
The vestibular system for eye movement control
N77-12674
Plasticity in the adult vestibulo-ocular reflex arc
N77-12675
An adaptive neural model compatible with plastic changes induced in the human vestibulo-ocular reflex by prolonged optical reversal of vision
N77-12676
The response to sound of identified reticulo-spinal cells
N77-12677
Subjective detection of vertical acceleration: A velocity dependent response?
N77-12678
Human subjective and reflex responses to sinusoidal vertical acceleration
N77-12679

DEFENSE COMMUNICATIONS ENGINEERING CENTER, RESTON, VA.
SOL-370 language reference manual and users' guide
[AD-A025927] N77-12753

DEFENSE SUPPLY AGENCY, ALEXANDRIA, VA.
Scientific and technical information needs of users or potential users of the DSA-administered, DoD Information Analysis Centers
[AD-A024937] N77-12928

DELAWARE UNIV., NEWARK.
Physical-chemical methods for the control of algal species and composition in algal culturing facilities
[PB-256784/0] N77-12600
Luminescence properties of cyclic polynitramines
N77-12850

DENVER RESEARCH INST., COLO.
Characterization study of domestic nickeliferous laterites by electron optical and X-ray techniques
[PB-256699/0] N77-12499

DEPARTMENT OF TRANSPORTATION, WASHINGTON, D.C.
An overview of Federal technology transfer
[PB-255693/4] N77-12953

DETROIT DIESEL ALLISON, INDIANAPOLIS, IND.
Through-flow calculations: Theory and practice in turbomachinery design
N77-12017

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE [WEST GERMANY].
Compressor design and experimental results
N77-12023
Comparison between the calculated and the experimental results of the compressor test cases
N77-12024

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN [WEST GERMANY].
Picking up and graphing of three dimensional flow fields
N77-11986
Gas flows with solid particles: Research and development in Germany
N77-12354

DEUTSCHER WETTERDIENST, OFFENBACH AM MAIN [WEST GERMANY].
Annals of meteorology no. 10: Development of meteorological observations in northern and central Germany up to 1700
[ISBN-3-88148-145-1] N77-12641

DEUTSCHES HYDROGRAPHISCHES INSTITUT, HAMBURG [WEST GERMANY].
Research ship Meteor of the German Research Society and the German Hydrographical Institute. Voyage no. 35 [21 October - 21 November 1974] North Sea [RANOSP]
N77-12662

DIKEWOOD INDUSTRIES, INC., ALBUQUERQUE, N. MEX.
Assembling of the range partials into the range word in the ACMI system
[AD-A024770] N77-12287

DOD AIRCRAFT GROUND FIRE SUPPRESSION AND RESCUE OFFICE, WRIGHT-PATTERSON AFB, OHIO.
Evaluation of radio communications for use by individual fire fighters
[AD-A025936] N77-12273

DORNIER-SYSTEM G.M.B.H., FRIEDRICHSHAFEN [WEST GERMANY].
Theoretical and experimental simulation methods for external store separation trajectories
N77-11981
Numerical simulation of three dimensional transonic flow including wind tunnel wall effects
N77-11984

DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
Advanced composite rudders for DC-10 aircraft: Design, manufacturing, and ground tests
[NASA-CR-145068] N77-12039

DRAPER [CHARLES STARK] LAB., INC., CAMBRIDGE, MASS.
Task descriptors for automated assembly
[PB-255545/6] N77-12410

DREHER [JOHN J.], ARCADIA, CALIF.
New approaches to titanium alloy microstructure-property characterization
[AD-A025734] N77-12199

DREXEL UNIV., PHILADELPHIA, PA.
Dynamic behavior of laminated polymeric matrix composites
[AD-A025622] N77-12135
Interlaminar strength of laminated polymeric matrix composites
[AD-A024722] N77-12138
Reduced order models for power system analysis
N77-12291
Topics in the application of summation methods
N77-12780
A program of study on the aggregation of molecules and their effect on sound propagation
[AD-A025767] N77-12835

DURHAM UNIV. [ENGLAND].
Through-flow calculations in axial turbomachinery: A technical point of view
N77-12015

DYNAMICS RESEARCH CORP., WILMINGTON, MASS.
Nonlinear spline method for optimal thrust vector control atmospheric interceptor guidance
N77-12789

DYNATECH R/D CO., CAMBRIDGE, MASS.
Thermal energy storage material thermophysical property measurement and heat transfer impact
[NASA-CR-135098] N77-12510

E

ECON, INC., PRINCETON, N.J.
SEASAT: A candidate ocean industry economic verification experiments
[NASA-CR-149228] N77-12476

SEATSAT programs option analysis
[NASA-CR-149229] N77-12477
A methodology for the evaluation of program cost and schedule risk for the SEASAT program
[NASA-CR-149230] N77-12478
A plan for application system verification tests: The value of improved meteorological information, volume 1
[NASA-CR-149210] N77-12634
A plan for application system verification tests. The value of improved meteorological information, volume 2
[NASA-CR-149169] N77-12635
A plan for application system verification tests--The value of improved meteorological information: Executive summary
[NASA-CR-149168] N77-12636
PECHCV, PECHFV, PEFHCV and PEFHFV: A set of atmospheric, primitive equation forecast models for the Northern Hemisphere, volume 3
[NASA-CR-149027] N77-12637

EDGEWOOD ARSENAL, ABERDEEN PROVING GROUND, MD.
Aerosol spectroscopy in the infrared
[AD-A025985] N77-12631

EEG RESEARCH INST., OSLO [NORWAY].
Clearance and saturation of hydrogen gas in man with special emphasis on the brain
[AD-A025952] N77-12692

EIMAC, SAN CARLOS, CALIF.
Multimode phased array tube
[AD-A025691] N77-12316

ELEKTRONIKCENTRALEN, HOERSHOLM [DENMARK].
Electronic components: A survey of the most used component types, their characteristic data, applications and failure rates
[ECR-62] N77-12293
Transients in low voltage power system: Descriptions of transients observed in the area of Copenhagen in some industries, hospitals, offices, laboratories, etc.
[ECR-63] N77-12294
Microstrips for UHF and microwaves: An evaluation of substrate materials and metallization technology for thin- and thickfilm microstrips
[ECN-19] N77-12295
Thick and thinfilm inductors: An investigation of design and manufacturing parameters for VHF and UHF inductors made in film techniques
[ECR-64] N77-12296
High emissivity coatings for IR-temperature measurements
[ECN-15] N77-12366
Product assurance programme plan for high reliability products
[ECR-59] N77-12424

EMMANUEL COLL., BOSTON, MASS.
Satellite beacon data reduction and analysis
[AD-A025329] N77-12617
Lightning strike warnings for tethered balloon operations
[AD-A025486] N77-12649

ENERGY AND ENVIRONMENTAL ANALYSIS, INC., ARLINGTON, VA.
Laws and regulations affecting coal with summaries of Federal, State, and local laws and regulations pertaining to air and water pollution control, reclamation, diligence and health and safety, part 1
[PB-255927/6] N77-12592

ENVIRONMENTAL HEALTH LAB., MCCLELLAN AFB, CALIF.
A bioenvironmental study of emissions from refuse derived fuel
[AD-A024661] N77-12571

ENVIRONMENTAL MONITORING AND SUPPORT LAB., RESEARCH TRIANGLE PARK, N.C.
Quality assurance handbook for air pollution measurement systems. Volume 1: Principles
[PB-254658/8] N77-12567

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO.
Laboratory procedure for the potential heat determination in solid wastes
[PB-256378/1] N77-12586

ENVIRONMENTAL PROTECTION AGENCY, DENVER, COLO.
Ammonia toxicity
[PB-256447/4] N77-12577

ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
Directory of air quality monitoring sites active in 1974
[PB-256708/9] N77-12578

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Compliance status of major air pollution facilities
[PB-256653/7] N77-12588
Summary characterizations of selected chemicals of near-term interest
[PB-255817/9] N77-12591

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR.
Thermoplastic modulator brassboard
[AD-A025450] N77-12317

EPSCO LABS., WILTON, CONN.
Development of a speech amplifier system for use with the Navy A4 oxygen breathing apparatus and a proposed firefighting instructor's breathing device
[AD-A025184] N77-12321

EQUITABLE ENVIRONMENTAL HEALTH, INC., WOODBURY, N.Y.
Selected aspects of waste heat management
[PB-254401/3] N77-12568

ERNST AND ERNST, WASHINGTON, D.C.
Review of energy forecasting methodologies and assumptions
[PB-255170/3] N77-12526

ESSEX CORP., ALEXANDRIA, VA.
Backlog and delay with wartime airlift
[AD-A025959] N77-12028

EUROPEAN SPACE AGENCY, PARIS [FRANCE].
Effect of specific configuration changes on the aerodynamics of the MSC-040-A orbiter at transonic speeds
[ESA-TT-332] N77-12002
Display and calculation of flow past wings in supersonic flight
[ESA-TT-333] N77-12003
On the simulation of an underexpanded propulsive jet for the investigation of the static longitudinal stability of an axially symmetric flight vehicle in supersonic flow
[ESA-TT-334] N77-12004
Aerodynamic coefficients and position of the bow shock wave of circular cones with pointed and spherically blunted noses in supersonic flow
[ESA-TT-335] N77-12005
Flight simulator evaluation of an electronic paravisual guidance indicator
[ESA-TT-350] N77-12056
High resolution 7 - 16 micron infrared spectrometry
[ESA-TT-328] N77-12159
Application of coherent anti-Stokes Raman scattering to measurements of gas concentrations in aerodynamic flows
[ESA-TT-331] N77-12160
Emission spectroscopical investigation of the system F2-H2 in a shock tube
[ESA-TT-349] N77-12161
Investigation of the stress corrosion cracking susceptibility of the alloy AlZnMgCu 1.5 with regard to electrochemical and metallurgical aspects
[ESA-TT-336] N77-12186
Specific heat of dilute transition alloys
[ESA-TT-353] N77-12187
Investigation of boundary layer-like flows with pressure gradients at high freestream Mach numbers
[ESA-TT-348] N77-12338
Similar solutions of the differential equations for mean velocities, turbulence energy and turbulence length
[ESA-TT-354] N77-12339
Measurement of gaseous minor constituents in the natural stratosphere
[ESA-TT-337] N77-12615
Distortion of weak shock and sound waves by atmospheric turbulence
[ESA-TT-355] N77-12616
A computer program for the calculation of relative emission coefficients of diatomic molecules in the high temperature range
[ESA-TT-300] N77-12914

F

FEDERAL ENERGY ADMINISTRATION, WASHINGTON, D.C.
A survey of salt deposits and salt caverns: Their relevance to the strategic petroleum reserve
[PB-255948/2] N77-12500
Crude oil supply alternatives for the Northern Tier states
[PB-255991/2] N77-12530
Petroleum market shares. Report on sales of propane to ultimate consumers, 1975
[PB-255624/9] N77-12540
Implementing coal utilization provisions of Energy Supply and Environmental Coordination Act
[PB-255855/9] N77-12549
Economics of depletable resources: Market forces and intertemporal bias
[PB-255623/1] N77-12930

FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D.C.
The effect of auditory and visual presentation of navigational messages on message retention
[PB-256599/2] N77-12706

FLORENCE UNIV. [ITALY].
Analysis of strip line dispersion
N77-12298
A visual display system for the HP 2100A computer
[R-1-76] N77-12723
CHILD: A system for the development and didactic introduction to microprocessors
[R-4-76] N77-12768
Characteristic exponents and linear control problems
N77-12775
Asymptotic properties of solutions of the equation y'=f[x]phi[y]
N77-12791
Invariant measures and its applications
N77-12792
Periodic solutions of nonlinear hyperbolic partial differential equations
N77-12793
Spectral estimation with reduction of processed data
[R-2-75] N77-12818

FLORIDA UNIV., GAINESVILLE.
Electrical properties of polycrystalline ceramic insulators
[AD-A025312] N77-12221
Distance constraints for tree network multifacility location problems
[AD-A025287] N77-12770
A subgradient procedure for the solution of minimax location problems
[AD-A025288] N77-12796

FLUGZEUGWERKE, EMMEN [SWITZERLAND].
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430

FOM-INSTITUUT VOOR PLASMAFYSICA, JUTPHAAS [NETHERLANDS].
The behaviour of impurities in a steady-state DT gas-blanket reactor
[REPT-75-90] N77-12877

FRANKFORD ARSENAL, PHILADELPHIA, PA.
High strength-high damping capacity wrought magnesium alloys
[AD-A025164] N77-12212
Analysis and characterization of high purity talc for use in propellants; determination of talic in propellants
[AD-A025122] N77-12234
Laser interferometer techniques for inspection of optical components
[AD-A025088] N77-12385
Reflective dielectric coatings as laser countermeasures
[AD-A024762] N77-12388

FRANKLIN INST., SWARTHMORE, PA.
Study of semiconductor surfaces using the technique of optical second harmonic generation
[AD-A024981] N77-12910

FRANKLIN INST. RESEARCH LABS., PHILADELPHIA, PA.
Design studies of a motion system for the VTOL simulation facility
[AD-A024732] N77-12075

G

GEC TURBINE GENERATORS LTD., MANCHESTER [ENGLAND].
Through-flow calculation procedures for application to high speed large turbines
N77-12020

GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Analysis of pressure distortion testing
[NASA-CR-2766] N77-12041

GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Onboard experiment data support facility. Task 2 report: Definition of onboard processing requirements
[NASA-CR-151108] N77-12120

GENERAL ELECTRIC CO., SYRACUSE, N.Y.
Fluid cooling of high power density semiconductor devices
[AD-A025815] N77-12314

GEOLOGICAL SURVEY, DENVER, COLO.
Programmer's guide for REMAPP REMote Sensing Array Processing Procedures
[PB-256693/3] N77-12758
OPTRIN and OPTAPE: Programs for interchange of data between REMAPP and the OPTRONICS P-1700 system
[PB-256692/5] N77-12760
An optimal method for evaluating a class of convolution integrals with related kernels
[PB-251156/6] N77-12795

GEOLOGICAL SURVEY, HONOLULU, HAWAII.
Water resources data for Hawaii and other Pacific areas, water year 1975
[PB-256668/5] N77-12497

GEOLOGICAL SURVEY, LITTLE ROCK, ARK.
Water resources data for Arkansas, water year 1975
[PB-256671/9] N77-12494

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Studies of the inner shelf and coastal sedimentation environment of the Beaufort Sea from ERTS-A
[E77-10043] N77-12473

GEOLOGICAL SURVEY, ROLLA, MO.
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495

GEOLOGICAL SURVEY, TRENTON, N.J.
Water resources data for New Jersey, water year, 1975
[PB-256802/0] N77-12496

GEORGE WASHINGTON UNIV., WASHINGTON, D.C.
On-line virtual architecture tuning using microcapture
N77-12741
Schreibersite growth and its influence on the metallography of coarse structured iron meteorites
N77-12958
GEORGIA INST. OF TECH., ATLANTA.
Experiments and analysis related to external burning for propulsion
[AD-A024984] N77-12128
A study of near-field data handling and probe design techniques
[AD-A024990] N77-12283
A diffraction technique to measure size distribution of large airborne particles
[PB-255454/1] N77-12599
Chemical release triangulation and winds in the altitude range 93 km to 176 km
[AD-A024952] N77-12653
Stability analysis of extended gyrostats
N77-12829
Computational techniques for the study of infrasound propagation in the atmosphere
[AD-A024951] N77-12836
The synthesis, magnetic studies, and single crystal X-ray diffraction structures of polynuclear copper [I] oxime imines of 2, 3-butanedione
N77-12889
GORDIAN ASSOCIATES, INC., NEW YORK.
Evaluation of the air-to-air heat pump for residential space conditioning
[PB-255652/0] N77-12545
GRENOBLE UNIV. [FRANCE].
Follow-up filter
[CEPHAG-23/75] N77-12299
Magnetosphere dynamics by localization of ultra low frequency waves
[CEPHAG-3/76] N77-12614
GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Fractographic evaluation of fracture specimens
[AD-A025746] N77-12194
GTE SYLVANIA, INC., MOUNTAIN VIEW, CALIF.
Lithium iodate parametric oscillator
[AD-A025758] N77-12392

H

HARRIS CORP., MELBOURNE, FLA.
Multiple Target Instrumentation Radar [MTIR] study, phase 2, add-on
[AD-A025939] N77-12272
HARRY DIAMOND LABS., ADELPHI, MD.
Nuclear electromagnetic pulse simulation by point source injection techniques for shielded penetrations
[AD-A024803] N77-12276
Incremental technique for absolute measurement of coherent power at millimeter and submillimeter wavelengths
[AD-A025201] N77-12285
Survey of radiation effects in metal insulator semiconductor devices
[AD-A024809] N77-12311
Transient currents in partially shielded conductors: A circuit model
[AD-A025135] N77-12324
Printer version of plots made by an incremental plotter
[AD-A025898] N77-12728
HARVARD UNIV., CAMBRIDGE, MASS.
Microwave pulse sequence methods for the study of rotational relaxation processes
N77-12241
Semiconductors under high pressure
[AD-A025323] N77-12897
HAWAII UNIV., HONOLULU.
Tropical cyclone initiation by the tropical upper tropospheric trough
[AD-A025456] N77-12656
HONEYWELL CORPORATE RESEARCH CENTER, BLOOMINGTON, MINN.
Dip coating process: Silicon sheet growth development for the large-area silicon sheet task of the low-cost silicon solar array project
[NASA-CR-149242] N77-12513
HONEYWELL, INC., GOLDEN VALLEY, MINN.
Manufacturing methods and techniques for piezoelectric transformers
[AD-A025176] N77-12323
HUGHES AIRCRAFT CO., CARLSBAD, CALIF.
Storage camera tube with non-destructive readout
[AD-A024280] N77-12301
HUGHES AIRCRAFT CO., CULVER CITY, CALIF.
Reflective coatings reliability study
[AD-A025757] N77-12863
HUGHES AIRCRAFT CO., TORRANCE, CALIF.
Millimeter dual helix traveling-wave tube
[AD-A025104] N77-12308
Intermodulation study
[AD-A025689] N77-12315
HUGHES RESEARCH LABS., MALIBU, CALIF.
Study of surface finishing and coating of DF laser windows
[AD-A025710] N77-12396
Multidither adaptive algorithms
[AD-A025185] N77-12765
Predetection compensated imaging
[AD-A025190] N77-12870
HUMAN FACTORS RESEARCH, INC., GOLETA, CALIF.
Motion sickness incidence: Exploratory studies of habituation, pitch and roll, and the refinement of a mathematical model
[AD-A024709] N77-12689

I

IBM FEDERAL SYSTEMS DIV., HUNTSVILLE, ALA.
Data bus network simulation
[AD-A025115] N77-12772
IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
Numerical methods for stiff nonlinear and quadratic differential equations
[AD-A025200] N77-12810
ILLINOIS INST. FOR ENVIRONMENTAL QUALITY, CHICAGO.
A method for the determination of total mercury in ambient air
[PB-255698/3] N77-12590
ILLINOIS INST. OF TECH., CHICAGO.
Modification of the penalty function algorithm to reduce computational effort
N77-12739
ILLINOIS UNIV., CHICAGO.
Priorities in air pollution source control: Modeling of population exposures and health effects
N77-12558
Metabolic rates in five animal populations after long-term exposure to sanguine/sea-farer ELF Electromagnetic fields in nature
[AD-A024955] N77-12668
A model for analytic investigation of three-dimensional head-spine dynamics
[AD-A025911] N77-12686
ILLINOIS UNIV., URBANA.
The role of coding in multiple-access satellite communication systems
[AD-A025612] N77-12116
On the isotope effect in hydrogen embrittlement of niobium
[AD-A025180] N77-12211
Pilot interaction with automated airborne decision making systems
N77-12695
The design of totally self-checking systems
[AD-A025608] N77-12725
Maximal clocking rates for pipelined digital systems
[AD-A025611] N77-12726
On finding K nearest neighbors in the plane
[AD-A025610] N77-12747
Multitarget sputtering using decoupled plasmas
[AD-A025609] N77-12895
INDIAN INST. OF TECH., BOMBAY.
Jet impingement of a curved surface
N77-12334
MHD oscillatory flow past a semi-infinite flat plate
N77-12876
INDIANA UNIV., BLOOMINGTON.
Electrostatic calculations in membrane systems
N77-12146
Studies into tunable-laser-excited atomic fluorescence spectrometry
N77-12381
INDUSTRIAL ENVIRONMENTAL RESEARCH LAB., RESEARCH TRIANGLE PARK, N. C.
Proceedings: Symposium on Flue Gas Desulfurization, volume 1
[PB-255317/0] N77-12597
INDUSTRIEANLAGEN-BETRIEBSGESELLSCHAFT M.B.H., OTTOBRUNN [WEST GERMANY].
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430
INFORMATICS, INC., ROCKVILLE, MD.
Bibliography of Soviet laser developments, Number 22, October - December 1975
[AD-A025913] N77-12387
Bibliography of Soviet Material on Internal Waves, no. 6, November 1975 - April 1976
[AD-A025813] N77-12664
SOVRAD: A digest of recent Soviet R and D articles, volume 2, number 3, 1976
[AD-A025814] N77-12994
INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS [FRANCE].
Portable N wave generators of different power for simulation of sonic booms
[ISL-R-123/75] N77-12833
INSTITUT FUER FESTKOERPERMECHANIK, FREIBURG [WEST GERMANY].
Growth of part-through cracks in simple construction elements
[IFKM-76/1] N77-12439
INSTITUTE FOR DEFENSE ANALYSES, ARLINGTON, VA.
The application of design-to-cost acquisition policies to selected electronics subsystem development programs
[AD-A024895] N77-12931
INSTITUTO GEOGRAFICO AGUSTIN CODAZZI, BOGOTA [COLOMBIA].
History of earthquakes in Colombia
N77-12607
INTELCOM RAD TECH, SAN DIEGO, CALIF.
Study of the effects of radiation on the electrical and optical properties of HgCdTe
[AD-A025222] N77-12257
IOWA STATE WATER RESOURCES RESEARCH INST., AMES.
Improving water quality by control of algae: Cellular and extracellular blue-green algal polysaccharides
[PB-254614/1] N77-12563
IOWA UNIV., IOWA CITY.
Optimal design of mechanical systems with intermittent motion
[AD-A025010] N77-12421
A region of intense plasma wave turbulence on auroral field lines
[NASA-CR-149209] N77-12620
ISTITUTO SUPERIORE DI SANITA, ROME [ITALY].
The Frascati [e, e'p] experimental apparatus
[ISS-P-75/3] N77-12072
Physical and biological aspects of thermal pollution in sea water
[ISS-L-75/14] N77-12560
Review of radiochemical methods for Pu-239 detection in environmental and biological samples
[ISS-R-75/12] N77-12682
Radiation exposure of the Italian population due to medical diagnostic examinations in 1974
[ISS-P-75/13] N77-12683
Health implications of the risks connected with the use of americium 241 for lightning protection
[ISS-R-75/16] N77-12684
Electron spin resonance of lyophilized blood sample
[ISS-P-75/17] N77-12685
Graphic display unit for the IBM 7040 computer of the Higher Institute of Health
[ISS-T-75/2] N77-12724
A detector test for low background measurement
[ISS-T-75/11] N77-12991

J

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
Comparative analysis of designs and implementations of reaction flying vehicles proposed during the nineteenth and beginning of the twentieth centuries
[NASA-TT-F-16749] N77-12081
Orbiter description document for Jupiter Orbiter Probe 1981/1982 Mission
[NASA-CR-149244] N77-12097
Triangular covariance factorizations for
[NASA-CR-149147] N77-12115
Analysis of liquid-propellant rocket engines designed by F. A. Tsander
[NASA-TT-F-16748] N77-12122
Pulsed thermionic converter study
[NASA-CR-149234] N77-12123
Effects of the physiological environment on the long-term physical performance of polymeric materials
[NASA-CR-149206] N77-12220
Space communication system for compressed data with a concatenated Reed-Solomon-Viterbi coding channel
[NASA-CASE-NPO-13545-1] N77-12240
Final engineering report for Goldstone operations support radar
[NASA-CR-149239] N77-12244
Simplifier cut core inductor design
[NASA-CR-149241] N77-12292
LUMIS: Land Use Management and Information Systems; coordinate oriented program documentation
[NASA-CR-149165] N77-12483
Wind power prediction models
[NASA-CR-149235] N77-12509
Web-dendritic ribbon growth
[NASA-CR-149237] N77-12512
Dip coating process: Silicon sheet growth development for the large-area silicon sheet task of the low-cost silicon solar array project
[NASA-CR-149242] N77-12513
Low cost silicon solar array project. Task 1: Establishment of the feasibility of a process capable of low cost, high volume production of silane, SiH4
[NASA-CR-149238] N77-12514
Large area silicon sheet by EFG
[C-500] N77-12515

Chemical vapor deposition growth
[NASA-CR-149233] N77-12516
Review of world experience and properties of materials for encapsulation of terrestrial photovoltaic arrays
[NASA-CR-149215] N77-12524
High-efficiency thin-film GaAs solar cells
[PB-255821/1] N77-12550
Computer interface system
[NASA-CASE-NPO-13428-1] N77-12721
The covariance matrix for the solution vector of an equality-constrained least-squares problem
[NASA-CR-149232] N77-12788

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Viscous effects in water waves
N77-12326
Far-infrared, chemical water lasers
N77-12382
Computer-produced faces as an iconic display for complex data
N77-12720
Variational calculations with hyperspherical basis sets on atomic helium and lithium
N77-12839
Electron impact excitation of molecular nitrogen: High energy-resolution studies of electron impact optical excitation functions of the first positive system
N77-12885

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
Calculation of cost in design of machinery
[JPRS-68285] N77-12422
USSR Academy of Medical Sciences
[JPRS-68310] N77-12693
Jupiter and Saturn. Giants of the solar system
[NASA-TT-F-17274] N77-12986

K

KANNER [LEO] ASSOCIATES, REDWOOD CITY, CALIF.
F. A. Tsander and modern cosmonautics
[NASA-TT-F-17096] N77-12080
Report on one year's flight: INTASAT satellite project
[NASA-TT-F-16739] N77-12095
USA report proposes: An end to free satellite pictures
[NASA-TT-F-16732] N77-12479
Energy storage systems: Behavior of SD 15K hermetically sealed NiCd cells; development trends
[NASA-TT-F-16761] N77-12508

KANSAS DEPT. OF TRANSPORTATION, TOPEKA.
Pavement surface dynamics friction measurement and analysis in Kansas
[PB-255490/5] N77-12459

KANSAS UNIV. CENTER FOR RESEARCH, INC., LAWRENCE.
Agricultural and hydrological applications of radar
[NASA-CR-151107] N77-12243

KAWECKI BERYLCO INDUSTRIES, INC., READING, PA.
Fabrication and evaluation of hot isostatically pressed beryllium
[AD-A024780] N77-12198

KENTUCKY UNIV., LEXINGTON.
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 1: Multiconductor transmission line theory
[AD-A025028] N77-12304
Applications of multiconductor transmission line theory to the prediction of cable coupling. Volume 2: Computation of the capacitance matrixes for ribbon cables
[AD-A025029] N77-12305

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.
Hydrodynamic separation of solids from solid-liquid mixtures
[PB-254490/6] N77-12938

KING RESEARCH, INC., ROCKVILLE, MD.
Statistical indicators of scientific and technical communication [1960-1980]. Volume 3: A data appendix to volume 2
[PB-255503/5] N77-12927

KYOTO UNIV. [JAPAN].
Cathodic protection in corrosion fatigue of an Al-Zn-Mg alloy
N77-12178

KYUSHU UNIV., FUKUOKA [JAPAN].
Speckle pattern correlation method for measurement of surface structural changes caused by fatigue
N77-12433

L

LABORATOIRE D'AEROTHERMIQUE DU C.N.R.S., MEUDON [FRANCE].
Fourier analysis and the correlation of speed with nonstationary aerodynamics
N77-11985

LABORATOIRE DE RECHERCHES BALISTIQUES ET AERODYNAMIQUES, VERNON [FRANCE].
Supersonic aircraft after body study of a thick boundary layer on a two-dimensional step
[LRBA-E-815-PV-4/SAE] N77-12001
Evaluation techniques for ball bearings using a high speed test bench
[LRBA-E-602-NT-42/SIE] N77-12407
Ball bearings for gyroscope axis. Simple movements of the retainer
[LRBA-E-602-NT-49/SIE] N77-12408

LABORATORIUM FUER BETRIEBSFESTIGKEIT, DARMSTADT [WEST GERMANY].
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430
Fatigue under combined out of phase multiaxial stresses
N77-12431

LAMAR UNIV. BEAUMONT, TEX.
Evaluation of selected space shuttle orbiter antenna systems
N77-12238

LEHIGH UNIV., BETHLEHEM, PA.
Fracture of composite orthotropic plates containing periodic buffer strips
N77-12131
The effect of adhesive layer on crack propagation in laminates
N77-12132
An empirical technique for predicting flow curves
N77-12327

LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
How to switch a beam-forming network with minimum disturbance to existing communication channels
[AD-A025208] N77-12302
Seismic discrimination
[AD-A025777] N77-12627
Solid state research, 1975: 4
[AD-A025489] N77-12901

LINTON AND CO., INC., WASHINGTON, D. C.
Financial critical factors analysis
[PB-254377/5] N77-12937

LITTLE [ARTHUR D.], INC., CAMBRIDGE, MASS.
Outlook for research and development in the underground gasification of coal
[PB-256155/3] N77-12555
IR optical wave guide
[AD-A025953] N77-12874
Telecommunications and society, 1976-1991: Report to office of telecommunications policy executive Office of the President
[PB-256829/3] N77-12942
Float-zone processing in a weightless environment
[NASA-CR-2768] N77-12954

LITTON SYSTEMS, INC., SAN CARLOS, CALIF.
Development of computer program TWTVA for calculation of 3-D electron trajectories in coupled-cavity TWTS
[AD-A025132] N77-12757

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Evaporation and surface energy of a metal deposited in a discontinuous thin film
N77-12179
Method of computing the influence of spherically laminar inhomogeneities on tropospheric refraction and contribution to the radio refraction of mists, cloudiness and rain
N77-12242
On the computation of strongly underexpanded supersonic submerged jets
N77-12343
Methods of diminishing the influence of perturbing fields on magnetometric sensors
N77-12362
Tracker backscatter study
[AD-A025768] N77-12391
Mechanical damping of flywheel stabilization systems
N77-12404
Dynamic interaction of shells and plates with the ambient medium
N77-12432
Investigation of the absorption coefficients of Ge and MgF2 in the ultraviolet, visible, and near-infrared spectrum ranges in the 300 - 800 K band
N77-12856
Effectiveness of heat-emitting coatings with variable degree of blackness
N77-12893
Heterogeneous nucleation and its influence on the structure of thin films
N77-12898
Contribution to Frenkel condensation theory
N77-12899

LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
Study of factors affecting reactions in environmental chambers
[PB-256252/8] N77-12167

LOUISIANA DEPT. OF HIGHWAYS, BATON ROUGE.
A laboratory evaluation of sulphur-asphalt paving mixtures
[PB-254911/1] N77-12441

LOWELL UNIV., MASS.
The diastereosequence distribution resulting from a two-state mechanism involving first order Markovian addition steps
N77-12129

LOWELL UNIV. RESEARCH FOUNDATION, MASS.
Digital ionospheric sounding in support of arctic research
[AD-A024706] N77-12630

M

M-O VALVE CO. LTD., HAMMERSMITH [ENGLAND].
A follow-on study on crossed-field amplifiers for TVBS mission
[HR1084] N77-12251

MAINE UNIV., ORONO.
Ternary compound thin film solar cells
[PB-256254/4] N77-12546

MARTIN MARIETTA CORP., DENVER, COLO.
Analytical study of lightweight acoustic shrouds for shuttle experiments and payloads
[NASA-CR-150116] N77-12113
Analysis of Skylab follow-on orbital neutron environmental data
[NASA-CR-150109] N77-12368

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Three-dimensional flow calculation for a transonic compressor rotor
N77-12019
Narrow-band passive systems theory with applications to positioning and navigation
[AD-A025743] N77-12036
Study of processing and properties of graphite fiber/high temperature resin composites
[AD-A024733] N77-12141
Low cost data and text communication for the less developed countries: A study with special reference to the needs of the international agricultural research centers
[PB-256067/0] N77-12271
Reflood heat transfer in a light water reactor
[PB-256481/3] N77-12345
Heat transfer and carryover of low pressure water in a heated vertical tube
[PB-256480/5] N77-12346
Task descriptors for automated assembly
[PB-255545/6] N77-12410
Air quality considerations in transportation planning: Findings and recommendations on transportation control planning, phase 2
[PB-256424/3] N77-12576
Reasoning from incomplete knowledge in a procedural deduction system
[AD-A024971] N77-12750
Control for large scale and uncertain systems
[AD-A025819] N77-12779
A subject selection problem employing a new criterion
[AD-A025803] N77-12822
Technology and physics of infrared and point contact diodes
[AD-A025330] N77-12896

MASSACHUSETTS UNIV., AMHERST.
Interactions of water with hydrophilic polyether polyurethanes
N77-12214
Optical studies of the stress-induced crystallization of rubbers
N77-12215
The use of context in character recognition
N77-12744

MATERIALS RESEARCH AND DEVELOPMENT, INC., ROCKVILLE, MD.
Photographic plates for emission spectrographic analysis
[MQAD-R-234] N77-12371

MATERIALS SCIENCES CORP., BLUE BELL, PA.
Fatigue of notched fiber composite laminates. Part 2: Analytical and experimental evaluation
[NASA-CR-145039] N77-12133

MAX-PLANCK-INSTITUT FUER AERONOMIE, LINDAU UBER NORTHEIM [WEST GERMANY].
An overview of magnetospheric dynamics
[MPAE-W-100-76-01] N77-12613

MAX-PLANCK-INSTITUT FUER EXTRATERRESTRISCHE PHYSIK, MUNICH [WEST GERMANY].
A region of intense plasma wave turbulence on auroral field lines
[NASA-CR-149209] N77-12620

MAX-PLANCK-INSTITUT FUER STROEMUNGSFORSCHUNG, GOETTINGEN [WEST GERMANY].
Acoustic measurement of the circulation of vortices and the circulation distributions in wind tunnel model investigations
[MPIS-MITT-61] N77-12832
MCDONNELL AIRCRAFT CO., ST. LOUIS, MO.
Wind tunnel models for aero-optical interaction study
[AD-A024925] N77-12078
Digital processing and analysis of active multispectral data
[AD-A025009] N77-12401
MCDONNELL-DOUGLAS RESEARCH LABS., ST. LOUIS, MO.
CO chain-reaction chemical laser research
[AD-A024719] N77-12393
MECHANICAL TECHNOLOGY, INC., LATHAM, N.Y.
Analysis of cage motion
[AD-A025735] N77-12412
METHODIST HOSPITAL, HOUSTON, TEX.
Automated electroencephalography system and electroencephalographic correlates of space motion sickness, part 2
[NASA-CR-151106] N77-12680
METRIC ASSOCIATION, INC., BOULDER, COLO.
Information on the metric system and related fields
[NASA-TM-X-3449] N77-12992
MIAMI UNIV., OXFORD, OHIO.
Effects of sound on the vestibular system
[AD-A025969] N77-12690
MIAMI VALLEY REGIONAL PLANNING COMMISSION, DAYTON, OHIO.
Financial critical factors analysis
[PB-254377/5] N77-12937
MICHIGAN STATE UNIV., EAST LANSING.
Development and application of an interferometric system for measuring [illegible] displacements
[NASA-CR-145106] N77-12367
MICHIGAN UNIV., ANN ARBOR.
Unsteady transonic flow with heat addition
[AD-A024737] N77-12340
A prediction of response of the head and neck of US adult military population to dynamic impact acceleration from selected dynamic test subjects
[AD-A025785] N77-12702
Classification rules for exponential populations: Two parameter case
[AD-A025181] N77-12811
Exact and approximate Bayesian solutions for inference about variance components and multivariate inadmissibility
[AD-A025452] N77-12824
MIDWEST RESEARCH INST., KANSAS CITY, MO.
Measurement of atmospheric sulfates: Literature search and methods selection
[PB-254387/4] N77-12562
MISSION RESEARCH CORP., SANTA BARBARA, CALIF.
A universal impedance for soils
[AD-A025759] N77-12624
MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
Removal of algae from waste stabilization pond effluent
[PB-256512/5] N77-12593
An evaluation of public hearings on water development projects in Mississippi
[PB-256583/6] N77-12944
MISSOURI DEPT OF NATURAL RESOURCES, JEFFERSON CITY.
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495
MISSOURI STATE HIGHWAY DEPT., JEFFERSON CITY.
Water resources data for Missouri, water year 1975
[PB-256765/9] N77-12495
MISSOURI UNIV., COLUMBIA.
Disease information system
[AD-A025477] N77-12732
Classification rules for exponential populations: Two parameter case
[AD-A025181] N77-12811
MITRE CORP., MCLEAN, VA.
Data base design for demand-responsive transit
[PB-256820/2] N77-12945
MOBIL TYCO SOLAR ENERGY CORP., WALTHAM, MASS.
Large area silicon sheet by EFG
[C-500] N77-12515
MONTEVALLO RESEARCH ASSOCIATES, ALA.
Vignetting characteristics of the S-056 X-ray telescope
[NASA-CR-150107] N77-12859
MONTPELLIER UNIV. [FRANCE].
Some examples of transparent potentials in the classical approximation
[PM/76/6] N77-12794
Phenomenology of lepton production
[PM/76/5] N77-12848
MUNICIPAL ENVIRONMENTAL RESEARCH LAB., CINCINNATI, OHIO.
The cost of municipal water supply: A case study
[PB-255960/7] N77-12948

N

NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA [ONTARIO].
Application of computed shock standoff distances for windtunnel calibration at supersonic Mach numbers less than 1.2
N77-11980
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C.
Aeronautical Engineering: A special bibliography with indexes, supplement 74
[NASA-SP-7037[74]] N77-11967
Energy: A continuing bibliography with indexes
[NASA-SP-7043[10]] N77-12505
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 159
[NASA-SP-7011[159]] N77-12670
Research and technology objectives and plans. A summary, FY 1977 research and technology program
[NASA-TM-X-74296] N77-12925
Evolution of the solar system
[NASA-SP-345] N77-12959
The present structure of the planetary and satellite systems
N77-12960
The motion of planets and satellites
N77-12961
The small bodies
N77-12962
Forces acting on small bodies
N77-12963
Kepler motion of interacting bodies; jet streams
N77-12964
Collisions: Fragmentation and accretion
N77-12965
Resonance structure in the solar system
N77-12966
Spin and tides
N77-12967
Post-accretional changes in the solar system
N77-12968
Accretional processes
N77-12969
On the accretion of planets and satellites
N77-12970
Spin and accretion
N77-12971
Relations between comets and meteoroids
N77-12972
Plasma physics and hetegony
N77-12973
Model of the hetegonic plasma
N77-12974
Transfer of angular momentum and condensation of grains
N77-12975
Accretion of the condensation products
N77-12976
Transplanetary condensation
N77-12977
Chemical structure of the solar system
N77-12978
Mass distribution and the critical velocity
N77-12979
Meteorites and their precursor states
N77-12980
The structure of the groups of secondary bodies
N77-12981
Origin and evolution of the Earth-Moon system
N77-12982
The properties of the early sun
N77-12983
Origin of the earth's ocean and atmosphere
N77-12984
Solar and magnetospheric science
[NASA-TM-X-3440] N77-12990
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Applications of the real-time data analysis system in the Ames 40- by 80-foot wind tunnel
N77-11972
Experiments planned specifically for developing turbulence models in computations of flow fields around aerodynamic shapes
N77-11982
Aerodynamic design guidelines and computer program for estimation of subsonic wind tunnel performance
[NASA-TN-D-8243] N77-11993
Spectrally balanced chromatic landing approach lighting system
[NASA-CASE-ARC-10990-1] N77-12031
Advanced porous transonic wind-tunnel nozzles
[NASA-TM-X-73180] N77-12069
Automatic multiple-sample applicator and electrophoresis apparatus
[NASA-CASE-ARC-10991-1] N77-12157
Calculation of transonic flows using an extended integral equation method
[NASA-TM-X-74227] N77-12335
On the habitability of Mars: An approach to planetary ecosynthesis
[NASA-SP-414] N77-12718
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Systems and methods for determining radio frequency interference
[NASA-CASE-GSC-12150-1] N77-12247
LANDSAT 1 US cumulative catalog, 1975 - 1976
[NASA-TM-X-74298] N77-12468
LANDSAT 1 non-US cumulative catalog, 1975 - 1976
[NASA-TM-X-74297] N77-12469
LANDSAT US standard catalog
[NASA-TM-X-74261] N77-12490
LANDSAT US standard catalog
[GSFC/LU-76/008] N77-12491
LANDSAT non-US standard catalog
[NASA-TM-X-74259] N77-12492
LANDSAT non-US standard catalog
[NASA-TM-X-74258] N77-12493
Theory of thin screen scintillations for a spherical wave
[NASA-TM-X-71225] N77-12857
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
The theory of the gravitational potential applied to orbit prediction
[NASA-TM-X-58186] N77-12092
Differential pulse code modulation
[NASA-CASE-MSC-12506-1] N77-12239
Receiving and tracking phase modulated signals
[NASA-CASE-MSC-16170-1] N77-12248
The Large Area Crop Inventory Experiment [LACIE]
[NASA-TM-X-74225] N77-12480
Large Area Crop Inventory Experiment [LACIE]. Phase I: Evaluation report
[NASA-TM-X-74226] N77-12481
Low-cost data analysis systems for processing multispectral scanner data
[NASA-TR-R-467] N77-12767
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.
Low-speed wind-tunnel investigation of flight spoilers as trailing-vortex-alleviation devices on a medium range wide-body tri-jet airplane model
[NASA-TN-D-8360] N77-11968
Vortex simulation of the pressure field of a jet
[NASA-TM-X-73984] N77-11989
A method for the analysis of nonlinearities in aircraft dynamic response to atmospheric turbulence
[NASA-TN-D-8265] N77-11992
Scramjet nozzle design and analysis as applied to a highly integrated hypersonic research airplane
[NASA-TN-D-8334] N77-11994
Wind tunnel investigation of internally blown jet-flap STOL airplane model
[NASA-TN-D-8309] N77-11995
Low-speed wind-tunnel investigation of a large scale advanced arrow-wing supersonic transport configuration with engines mounted above wing for upper-surface blowing
[NASA-TN-D-8350] N77-11997
Investigation of very low blockage ratio boattail models in the Langley 16-foot transonic tunnel
[NASA-TN-D-8335] N77-11998
Correlation of full-scale helicopter rotor performance in air with model-scale Freon data
[NASA-TN-D-8323] N77-11999
Full-scale crash test of a CH-47C helicopter
[NASA-TM-X-3412] N77-12027
Generalization and refinement of an automatic landing system capable of curved trajectories
[NASA-TN-D-8336] N77-12032
Effects of upper-surface blowing and thrust vectoring on low speed aerodynamic characteristics of a large-scale supersonic transport model
[NASA-TN-D-8296] N77-12065
A parametric analysis of visual approaches for helicopters
[NASA-TN-D-8275] N77-12066
Design features and operational characteristics of the Langley 0.3-meter transonic cryogenic tunnel
[NASA-TN-D-8304] N77-12071
A comparison of spacecraft penetration hazards due to meteoroids and manmade earth-orbiting objects
[NASA-TM-X-73978] N77-12119
Effect of low velocity impact damage on the compressive strength of graphite/epoxy hat-stiffened panels
[NASA-TM-X-73988] N77-12134
Boron-epoxy-reinforced titanium aircraft landing-gear drag strut
[NASA-TN-D-8289] N77-12218
Auxiliary power system for activity cooled aircraft
[NASA-CASE-LAR-11626-1] N77-12332
Laboratory calibration of AAFE radiometer/scatterometer [RADSCAT]
[NASA-TM-X-73900] N77-12363
Analytical comparison of effects of solid-friction and viscous structural damping on panel flutter
[NASA-TN-D-8263] N77-12435
Structural analyses for the modification and verification of the Viking aeroshell
[NASA-TN-D-8300] N77-12436

A survey of kinetic data of compounds containing flourine
[NASA-TM-X-73983] N77-12609
An assessment of prewhitening in estimating power spectra of atmospheric turbulence at long wavelengths
[NASA-TN-D-8288] N77-12610
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Inlet total pressure loss due to acoustic wall treatment
[NASA-TM-X-73559] N77-11991
Cold-air performance of a tip turbine designed to drive a lift fan. 1: Baseline performance
[NASA-TM-X-3452] N77-12000
Summary of NASA aerodynamic and heat transfer studies in turbine vanes and blades
[NASA-TM-X-73518] N77-12059
Purging of a multilayer insulation with dacron tuft spacer by gas diffusion
[NASA-TM-X-3456] N77-12099
Thermal-environment testing of a 30-cm engineering model thruster
[NASA-TM-X-73522] N77-12121
Effect of a chromium-containing fuel additive on hot corrosion
[NASA-TM-X-73465] N77-12184
Directionally solidified iron-base eutectic alloys
[NASA-TN-D-8354] N77-12185
Sputtering
[NASA-TM-X-73527] N77-12236
An 82 to 84 percent efficient, small size, 2 and 4 stage depressed collector for octave bandwidth high performance TWT's
[NASA-TM-X-73572] N77-12297
Emissions and performance of catalysts for gas turbine catalytic combustors
[NASA-TM-X-73543] N77-12406
Traveling-wave tube reliability estimates, life tests, and space flight experience
[NASA-TM-X-73541] N77-12423
Space-to-earth power transmission system
[NASA-TM-X-73489] N77-12517
Measured performance of a 3 ton LiBr absorption water chiller and its effect on cooling system operation
[NASA-TM-X-73496] N77-12518
Status of silicon solar cell technology
[NASA-TM-X-73531] N77-12519
Outdoor performance results for NBS Round Robin collector no. 1
[NASA-TM-X-73547] N77-12520
Temperature distribution of a hot water storage tank in a simulated solar heating and cooling system
[NASA-TM-X-73549] N77-12521
The Redox flow system for solar photovoltaic energy storage
[NASA-TM-X-73562] N77-12522
Analysis of epitaxial drift field N on P silicon solar cells
[NASA-TM-X-73563] N77-12523
Nonpropulsive applications of ion beams
[NASA-TM-X-73511] N77-12847
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
General purpose rocket furnace
[NASA-CASE-MFS-23460-1] N77-12070
Preliminary vibration, acoustic, and shock design and test criteria for components on the SRB, ET, and SSME
[NASA-TM-X-64868] N77-12114
Parameters affecting electrostatic cooling
[NASA-TM-X-73350] N77-12329
Mechanical thermal motor
[NASA-CASE-MFS-23062-1] N77-12402
Method and apparatus for reconditioning nickel-cadmium batteries
[NASA-CASE-MFS-23270-1] N77-12511
Information on the metric system and related fields
[NASA-TM-X-3449] N77-12992
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.
Space communication system for compressed data with a concatenated Reed-Solomon-Viterbi coding channel
[NASA-CASE-NPO-13545-1] N77-12240
Computer interface system
[NASA-CASE-NPO-13428-1] N77-12721
NATIONAL AEROSPACE LAB., AMSTERDAM [NETHERLANDS].
Wind tunnel tests and aerodynamic computations; thoughts on their use in aerodynamic design
N77-11979
FALSTAFF. Description of a fighter aircraft loading standard for fatigue evaluation
N77-12430
NATIONAL AEROSPACE LAB., KAKUDA [JAPAN].
Secondary gas injection into a supersonic conical nozzle
N77-12336
NATIONAL ARCHIVES AND RECORDS SERVICE, WASHINGTON, D.C.
Code of federal regulations. 14. Aeronautics and space, parts 1 to 59
N77-12932
Code of federal regulations. 14. Aeronautics and space, parts 60 to 199
N77-12933
Code of federal regulations. 14. Aeronautics and space, parts 200 to 1199
N77-12934
NATIONAL ASSOCIATION OF REGIONAL COUNCILS, WASHINGTON, D.C.
A compilation of papers presented at the 208 Areawide Water Quality Management Workshops
[PB-254663/8] N77-12561
NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.
An analytical and experimental determination of the cutoff frequencies of higher-order TE modes in a TEM cell
[PB-256319/5] N77-12376
NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.
The electron factor in catalysis on metals electrocatalysis on non-metallic surfaces
[PB-256264/3] N77-12166
Progress report on the corrosion behavior of selected stainless steels in soil environments
[PB-256329/4] N77-12202
Ship steel weldments for low temperature service
[PB-256997/8] N77-12203
Environmental effects on the strength of a glass fiber-reinforced-plastic rod material
[PB-256296/5] N77-12224
Finite element simulation of weldbonded joint deformation
[PB-256995/2] N77-12455
Chemistry in the stratosphere
[PB-255862/5] N77-12633
A review of network access techniques with a case study: The network access machine
[PB-256525/7] N77-12773
Resonance lines and energy levels of Cs3, Ba4, and La5
[NASA-CR-149207] N77-12844
Equilibrium compositions and compressibility factors for air in the temperature range 1500 to 13000 Kelvin and for densities from 0.000001 to 1000 times standard density
[AD-A025449] N77-12916
NATIONAL CENTRE OF TRIBOLOGY, RISLEY [ENGLAND].
Thermal vacuum qualification tests on a Dornier medium speed despin mechanism
[ESA-ESTL-20] N77-12409
NATIONAL FIELD INVESTIGATIONS CENTER, DENVER, COLO.
An application of ERTS technology to the evaluation of coal strip mining and reclamation in the northern Great Plains
[NASA-CR-149208] N77-12486
NATIONAL LEAGUE OF CITIES, WASHINGTON, D.C.
A compilation of papers presented at the 208 Areawide Water Quality Management Workshops
[PB-254663/8] N77-12561
NATIONAL LENDING LIBRARY FOR SCIENCE AND TECHNOLOGY, BOSTON SPA [ENGLAND].
Distribution of electron density in a transitional metal impurity in dilute substitution solid solutions
[NLL-M-25348-[5828.4F]] N77-12173
Formation of an impeded recrystallization zone during the annealing of low-alloy molybdenum alloys
[NLL-M-25349-[5828.4F]] N77-12174
Engineering efficiency of high unit-capacity metallurgical units
[NLL-M-25379-[5828.4F]] N77-12175
Zonal energetics balances for the melting of carbon ferrochromium
[NLL-M-25334-[5828.4F]] N77-12176
Radiational heat exchange between surfaces with anisotropic radiation
[NLL-M-25350-[5828.4F]] N77-12328
A device for detecting amplitudes of vibration of turbodynamo blades
[NLL-M-24095-[5828.4F]] N77-12360
Protection of information when using microfilm
[NLL-M-24128-[5828.4F]] N77-12922
Lay-out of information of microfilm
[NLL-M-24127-[5828.4F]] N77-12923
Recognition of coded symbols on reading out data
[NLL-M-24126-[5828.4F]] N77-12924
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.
A VHF transmitter and system synchronizer for use in a portable Doppler radar system
[PB-256094/4] N77-12270
The radiation and energy budgets of the earth using both ground-based and satellite-derived values of total cloud cover
[PB-256756/8] N77-12632
Computer programs for multidimensional spectra array processing
[PB-256098/5] N77-12759
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D.C.
National hurricane operations plan
[PB-256824/4] N77-12657
National several local storms operation plan
[PB-256717/0] N77-12658
Mariners weather log, volume 20, number 3, May 1976
[PB-250014-03] N77-12659
NATIONAL OCEANOGRAPHIC INSTRUMENTATION CENTER, WASHINGTON, D.C.
Dissolved oxygen meter, model 57 [Yellow Springs Instrument Co., Inc., Ohio]
[PB-256754/3] N77-12378
NATIONAL SWEDISH INST. FOR BUILDING RESEARCH, STOCKHOLM.
Economic evaluation methods in community planning
[PB-253432/9] N77-12936
NAVAL ACADEMY, ANNAPOLIS, MD.
The kinetics of evolution of water vapor clusters in air
[AD-A025675] N77-12349
NAVAL AEROSPACE MEDICAL RESEARCH LAB., PENSACOLA, FLA.
Development of a prototype experimental plan to evaluate stabilized optical viewing devices. 2: Inflight measures of airsickness potential
[AD-A025455] N77-12704
NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
Effect of self-locking nuts on torque-tension relationship
[AD-A024893] N77-12417
Integration of aviators eye protection and visual aids
N77-12710
NAVAL AIR TEST CENTER, PATUXENT RIVER, MD.
Development of a tow capability for the HH-3F helicopter
[AD-A025790] N77-12050
NAVAL COASTAL SYSTEMS LAB., PANAMA CITY, FLA.
Towed planning sled for delivery of oil pollution control equipment
[AD-A025247] N77-12569
NAVAL ELECTRONICS LAB. CENTER, SAN DIEGO, CALIF.
Analysis of in-flight omega data [data taken 26 January - 7 February 1969 are compared with predicted values for paths from Hawaii to San Diego, Samoa, and Wake and from Samoa and Wake to Hawaii]
[AD-A025926] N77-12037
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
An experimental investigation of the Whistler nozzle and an analytical investigation of a ring wing in supersonic flow
[AD-A025672] N77-12009
An analysis of the position location and reporting system's performance characteristics
[AD-A025437] N77-12038
An integrated system approach for automatic switching radio telephony
[AD-A024889] N77-12265
A secure voice system with bandwidth reduction
[AD-A025433] N77-12275
The horizontally polarized dipole antenna as a solution to the problems of high frequency short range communications
[AD-A025674] N77-12277
Flow visualization of the turbulent jet at the exit of a single element nozzle by holographic technique, and mean velocity profile measurements with a laser Doppler anemometer
[AD-A025439] N77-12348
A program for the stability analysis of pipe Poiseuille flow
[AD-A024927] N77-12351
A study of boundary layer and mass bleed in a short length supersonic diffuser for a gas dynamic laser
[AD-A025673] N77-12394
A study of the crack damage in fuel-filled tank walls due to ballistic penetrators
[AD-A025430] N77-12449
Turbulent flux estimates from shipboard mean wind and temperature profiles and dissipation rates
[AD-A025438] N77-12650
The effect of continuous noise on short term memory performance tasks
[AD-A025446] N77-12694
Investigation and evaluation of a Zero Input Tracking Analyzer [ZITA]
[AD-A025431] N77-12700
An analysis of the effect of a flight director on pilot performance in a helicopter hovering task
[AD-A025680] N77-12701
Implementation of interactive graphics display in a multiprogramming environment
[AD-A025681] N77-12733
An evaluation and comparison of three nonlinear programming codes
[AD-A024930] N77-12763

The singular surface in the parameter space; applications
[AD-A024909] N77-12764
A program for the numerical solution of large sparse systems of algebraic and implicitly defined stiff differential equations
[AD-A024764] N77-12804
NAVAL RESEARCH LAB., WASHINGTON, D.C.
Electrostatic properties of JP-5 jet fuel from alternate sources
[AD-A025684] N77-12232
Performance of a range-ambiguous MTI and Doppler filter system
[AD-A025683] N77-12278
Evaluation of the radiation field in a spherically symmetric plasma
[AD-A024922] N77-12284
Development of a superconducting ELF receiving antenna
[AD-A024666] N77-12319
Fracture toughness of pressure vessel materials for light water reactors
[AD-A025808] N77-12461
Position-fixing and position-predicting programs for the Hewlett-Packard model 9830A programmable calculator
[AD-A024972] N77-12751
Laser radiation forces in magnetized plasmas
[AD-A025003] N77-12881
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Control theory with applications to naval hydrodynamics: The First David W. Taylor Lectures, April 1972
[AD-A025702] N77-12778
NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
A preliminary report on the in-house exploratory development program on microstrip patch antennas at the Naval Surface Weapons Center
[AD-A025304] N77-12256
Methods for solving the viscoelasticity equations for cylinder and sphere problems
[AD-A025302] N77-12800
NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.
A solving algorithm for systems of nonlinear algebraic equations
[AD-A025766] N77-12806
Time Delay Estimation
[AD-A025620] N77-12834
NAVAL UNDERWATER SYSTEMS CENTER, NEWPORT, R.I.
A study of the drag characteristics and polymer diffusion in the boundary layer of an axisymmetric body
[AD-A024667] N77-12227
Spectral analysis of a univariate process with bad data points, via maximum entropy and linear predictive techniques
[AD-A024942] N77-12756
NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.
Evaluation of insulation materials for advanced motor systems
[AD-A025306] N77-12124
An analysis of data input systems and a survey of other data bases for the Naval environmental Protection Support Service [NEPSS]
[AD-A035085] N77-12564
Low efficiency diffraction grating theory
[AD-A024804] N77-12866
NAVAL WEATHER SERVICE COMMAND, WASHINGTON, D.C.
US Naval Weather Service numerical environmental products manual
[AD-A024702] N77-12652
NEW MEXICO UNIV., ALBUQUERQUE.
Laser pyrolysis gas chromatography and plasma stoichiometric analysis
N77-12145
Oxygen potential of uranium-plutonium oxide as determined by controlled-atmosphere thermogravimetry
N77-12152
Quarterly literature review of the remote sensing of natural resources, third quarter 1976
[NASA-CR-149163] N77-12470
Applications of generalized spline functions to empirical Bayes estimation
N77-12814
NEWARK COLL. OF ENGINEERING, N.J.
Deposition of suspensions in laminar flow
[AD-A025886] N77-12341
NORTH CAROLINA STATE UNIV., RALEIGH.
Conference proceedings, Energy from the Oceans, Fact or Fantasy
[PB-256093/6] N77-12547
NORTH CAROLINA UNIV., CHAPEL HILL.
A guide to the Burr Type XII distributions
[AD-A025242] N77-12803
Implementation of proven technology in making the highway environment safe
[PB-256664] N77-12950
NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS, ARLINGTON.
Our natural resources: What is our water worth. 1975 - 1978 water quality management planning program, North Central Texas Council of Governments
[PB-256976/2] N77-12947
NORTHEASTERN UNIV., BOSTON, MASS.
Investigation of anharmonic self-energies in some ionic and displacive ferroelectric solids
N77-12882
NORTHERN ILLINOIS UNIV., DEKALB.
Differential coulostatic polarography
N77-12154
NORTHERN RESEARCH AND ENGINEERING CORP., CAMBRIDGE, MASS.
A critical review of turbine flow calculation procedures
N77-12022
NORTHWESTERN UNIV., EVANSTON, ILL.
Processing of polymeric materials
[PB-255986/2] N77-12225
NOTRE DAME UNIV., IND.
Alternatives for jet engine control
[NASA-CR-146531] N77-12058
Growth of single crystals of some rare-earth-cobalt compounds R2Co17, from the melt
[AD-A025141] N77-12913

O

OAK RIDGE ASSOCIATED UNIVERSITIES, TENN.
Net energy from nuclear power
[PB-254059/9] N77-12527
OAK RIDGE NATIONAL LAB., TENN.
Inverse mean free path, stopping power, CSDA range, and straggling in silicon and silicon dioxide for electrons of energy less than or equal to 10 keV
[AD-A025488] N77-12902
OCEAN DATA SYSTEMS, INC., MONTEREY, CALIF.
Data Assimilation Restorative-Iterative Model [RIMOD]
[AD-A024736] N77-12654
OCEAN DATA SYSTEMS, INC., ROCKVILLE, MD.
PECHCV, PECHFV, PEFHCV and PEFHFV: A set of atmospheric, primitive equation forecast models for the Northern Hemisphere, volume 3
[NASA-CR-149027] N77-12637
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS [FRANCE].
Operational use of computers associated with the Modane wind tunnels
N77-11971
Minimizing wall interference in connecuional transonic test sections by using computer parametric studies
N77-11978
French contribution to aerodynamics of gas-particle mixtures
N77-12353
OFFICE OF NAVAL RESEARCH, LONDON [ENGLAND].
Colloquium on Solid State Transmitters for Radar
[AD-A025189] N77-12255
Superconductivity: A changing R and D scene in Germany
[AD-A025445] N77-12906
OFFICE OF TELECOMMUNICATIONS, BOULDER, COLO.
Performance measurements over long line-of-sight microwave links in Colorado
[PB-256261/9] N77-12266
Signal-to-noise ratios in a PCM/PSK system
[PB-255939/1] N77-12267
Analysis of occurrence of sporadic E and accuracy of predictions of sporadic-E critical frequencies for Temperate Latitude Northern Hemisphere Stations
[PB-255875/7] N77-12268
World maps of sporadic E [foEs greater than 7 MHz] for use in prediction of VHF oblique-incidence propagation
[PB-255904/5] N77-12269
OGDEN AIR LOGISTICS CENTER, HILL AFB, UTAH.
Minuteman stage 3 component report
[AD-A025093] N77-12103
OHIO DEPT. OF ECONOMIC AND COMMUNITY DEVELOPMENT, COLUMBUS.
The Ohio land allocation model, phase 2
[E77-10042] N77-12472
Development of a multi-disciplinary ERTS user program in the state of Ohio
[E77-10045] N77-12475
OHIO STATE UNIV., COLUMBUS.
Mechanism of photochemically initiated oxidations
[PB-256397/1] N77-12575
Covariance expressions for second and lower order derivatives of the anomalous potential
[AD-A024720] N77-12626
OHIO UNIV., ATHENS.
Demonstration program for Omega receiver prototype microcomputer data processing
[NASA-CR-149226] N77-12029
An assembler for the MOS Technology 6502 microprocessor as implemented in jolt [TM] and KIM-1 [TM]
[NASA-CR-149227] N77-12030
Diurnal measurements with prototype CMOS Omega receivers
[NASA-CR-149160] N77-12606
OKLAHOMA STATE UNIV. RESEARCH FOUNDATION, STILLWATER.
Single channel monopulse converter
[AD-A025485] N77-12117
OLD DOMINION SYSTEMS, INC., GAITHERSBURG, MD.
Environmental position errors of the GPS. Army user equipment
[AD-A025940] N77-12101
OREGON GRADUATE CENTER FOR STUDY AND RESEARCH, BEAVERTON.
Propagation of multiwavelength laser radiation through atmospheric turbulence
[AD-A024863] N77-12389
OREGON STATE UNIV., CORVALLIS.
Hydraulic functions of soils from physical experiments and their applications
N77-12471
ORION RESEARCH, INC., CAMBRIDGE, MASS.
Species-differentiating continuous monitor for airborne acids
[AD-A025917] N77-12570
OWENS-ILLINOIS, INC., TOLEDO, OHIO.
Processing FeB03 glass-ceramics in space
[NASA-CR-150068] N77-12084
OWENS VALLEY RADIO OBSERVATORY, PASADENA, CALIF.
A high angular resolution study of the neutral hydrogen in the IrrII galaxy M82
[AD-A024806] N77-12985
OXFORD UNIV. [ENGLAND].
The thermal conductivity of metal-power/epoxy-resin composites
[AD-A024963] N77-12143

P

PACIFIC ENVIRONMENTAL SERVICES, INC., SANTA MONICA, CALIF.
Evaluation of SO2 emission control technology applicable to the East Helena lead smelter
[PB-255277/6] N77-12580
PARIS VI UNIV. [FRANCE].
Investigations of surfaces and interfaces using optical excitation of surface plasmons
[AD-A025285] N77-12162
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Hot corrosion and oxidation studies of pure nickel and Ni-Cr, Ni-Si and Ni-Cr-Si alloys at 1000 C
[AD-A024708] N77-12201
The numerical solution of the steady flow of Newtonian and non-Newtonian fluids through a contraction
[AD-A025774] N77-12344
Coating science and technology
[AD-A025487] N77-12411
Vibration and sound radiation of a plate
[AD-A024985] N77-12464
Experimental and theoretical investigation of the thermodynamic properties of sulfur hexafluoride in the liquid phase
[AD-A024986] N77-12919
PENNSYLVANIA UNIV., PHILADELPHIA.
Magnetic resonance studies of paramagnetic transition metal complexes
N77-12171
Planning models for the assessment of advanced energy storage systems
N77-12504
Resonance-enhanced allowed, field-induced and wave-vector-dependent Raman scattering from the surface region of InAs
N77-12887
A Moessbauer study of Sn[2+]-doped europium monochalcogenides and a new look at the experimental foundations of spin-wave theory
N77-12888
Axial effects in planar complexes: Iron tetraphenylporphyrinrin and nickel bisdiphenylglyoxime halides
N77-12890
PERKIN-ELMER CORP., POMONA, CALIF.
Engineering design criteria for an image intensifier/image converter camera
[NASA-CR-151112] N77-12365
PHILIPS LABS., BRIARCLIFF MANOR, NEW YORK.
Development of an optical disc recorder
[AD-A025291] N77-12372
PHYSIKALISCH-CHEMISCHES FORSCHUNGSLABOR, PHYSIKALISCH-CHEMISCHES FORSCHUNGSLABOR,
Further development and application of polycrystalline metal whiskers
[BMFT-FB-T-76-18] N77-12219

PITTSBURGH UNIV., PA.
Experimental and theoretical analysis of transonic flow around a sphere
N77-11987
Feasibility study of the use of current limiting devices in interruption and sectionalizing of DC circuits in mines
[PB-256541/4] N77-12322
POLITECNICO DI TORINO [ITALY].
Simulation software of digital data detection methods. Part 1: Theoretical analysis. Part 2: Computer programs
[THA/320/RWO/JS-PT-1/2] N77-12769
POLYTECHNIC INST. OF NEW YORK.
Interaction of aqueous electrolytes and quaternary ammonium salts
N77-12155
Measurements of the rheological properties of multipath polymeric systems
N77-12216
Side chain crystallization of long side chain polymers
N77-12217
Mutual coupling in spherical arrays of circular waveguide elements
N77-12290
Encoding reduction and classification of two-dimensional data by factor analysis techniques
N77-12738
Two-photon correlations in a widely divergent light beam
N77-12854
High order Borrmann diffraction
N77-12883
SPARCOM: A sparse matrix associative relational approach to dynamic data structuring and data retrieval
N77-12921
POLYTECHNIC INST. OF NEW YORK, BROOKLYN.
Software modeling studies
[AD-A025895] N77-12749
Ion binding studies of polysulfonates
N77-12840
POWER ELECTRONICS ASSOCIATES, INC., NORTH OLMSTED, OHIO.
Advanced power processing techniques for DC to DC converters
[AD-A025915] N77-12306
PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
Evaluation of augmenter light-off detection systems
[AD-A025321] N77-12061
Influence of subsurface defects on fatigue properties of titanium alloys
[AD-A025892] N77-12193
PRINCETON UNIV., N.J.
An experimental investigation of the flap-lag stability of a hingeless rotor with comparable levels of hub and blade stiffness in hovering flight
[NASA-CR-151924] N77-12040
Wave propagations in orthogonally reinforced fiber composites. A discrete model for reinforced composites viewed as polar media
[AD-A025596] N77-12136
Thermomechanics of fiber-reinforced composites
[AD-A024948] N77-12140
A search for chemical laser action in low pressure metal vapor flames
N77-12380
Efficient algorithms for chordal graphs and interval graphs
N77-12742
Monotone data flow analysis frameworks: A formal theory of global computer program optimization
N77-12743
Molecular orbital studies of electron deficient compounds
N77-12837
Quantum mechanical analysis of intramolecular interactions
N77-12838
PURDUE UNIV., LAFAYETTE, IND.
Unsteady transonic flow with heat addition
[AD-A024737] N77-12340
Dynamic response of anisotropic laminated plates under initial stress to impact of a mass
[AD-A025906] N77-12445
Systematic development of methodologies in planning urban water resources for medium size communities: Regional aquifer evaluation studies with stochastic inputs
[PB-256564/6] N77-12939
Systematic development of methodologies in planning urban water resources for medium size communities phase 1
[PB-256565/3] N77-12940
Systematic development of methodologies in planning urban water resources for medium size communities: Population characteristics and residential water use
[PB-256566/1] N77-12941

Q

QUEST RESEARCH CORP., MCLEAN, VA.
Feasibility of implementing specific performance measurement techniques
[AD-A025945] N77-12705

R

RAND CORP., SANTA MONICA, CALIF.
An overview discussion of propagation effects of nuclear environments on VLF-LF communication systems
[AD-A024956] N77-12286
A computer model for estimating development and procurement costs of aircraft DAPCA-III
[AD-A025276] N77-12929
RASOR ASSOCIATES, INC., SUNNYVALE, CALIF.
Pulsed thermionic converter study
[NASA-CR-149234] N77-12123
RAYTHEON CO., WALTHAM, MASS.
Development and fabrication of a space hardened Nd[+3] YAG laser transmitter system for orbital range and altitude control
[AD-A025155] N77-12107
RCA GOVERNMENT COMMUNICATIONS SYSTEMS, SOMERVILLE, N.J.
Low loss low hold power diode phase shifter development
[AD-A024779] N77-12312
RCA LABS., PRINCETON, N.J.
Image descriptors for display
[AD-A024960] N77-12871
RCA SOLID STATE TECHNOLOGY CENTER, SOMERVILLE, N.J.
Reliability evaluation of C/MOS technology in complex integrated circuits
[AD-A024918] N77-12911
RICE UNIV., HOUSTON, TEX.
Charge transport and the photorefractive effect in doped and undoped lithium tantalate
N77-12358
The role of charge transport in the formation and erasure of volume phase holograms in electrooptic lithium niobate
N77-12359
Finite deformation of elastic-plastic and elastic/viscoplastic continua
N77-12429
The exchange partition functions of the rigid asymmetric top
N77-12784
Nonparametric probability density estimation by optimization theoretic techniques
N77-12816
The superhyperfine structure of a system exhibiting the dynamic Jahn-Teller effect: CaF2:Sc[2+]
N77-12846
ROCHESTER UNIV., N.Y.
Intense pulse phenomena
[AD-A025483] N77-12845
ROCK ISLAND ARSENAL, ILL.
Measurement of the static influence coefficient of the AH-1G Cobra fuselage
[AD-A025114] N77-12044
ROCKWELL INTERNATIONAL CORP., ANAHEIM, CALIF.
Micro navigator [MICRON] phase 2A. Volume 2: Technical report
[AD-A021526] N77-12033
Reliability of deposited glass
[AD-A024664] N77-12226
Multiplexing techniques for advanced surface craft
[X76-979/301] N77-12245
Shipboard Data Multiplex System [SDMS]. A new design for lower ship cost and improved flexibility
[X75-1095/301] N77-12246
Coherent Optical Adaptive Techniques [COAT]
[AD-A025668] N77-12280
Ring Laser Attitude System
[AD-A025769] N77-12390
Coherent Optical Adaptive Techniques [COAT]
[AD-A025669] N77-12395
Chemical vapor deposition growth
[NASA-CR-149233] N77-12516
Silicon monolithic infrared detector array
[X76-1117/034A] N77-12858
ROCKWELL INTERNATIONAL CORP., EL SEGUNDO, CALIF.
Manufacturing unique glasses in space
[NASA-CR-150067] N77-12083
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Fatigue crack growth in aluminum alloys
[AD-A025196] N77-12207
ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
Time domain radiation fields of a monopole antenna
[AD-A025619] N77-12252
Microcircuit device reliability linear/interface microcircuit data
[AD-A019433] N77-12300
Mask pattern generation techniques
[AD-A025343] N77-12727
ROSS AND BARUZZINI, INC., ST. LOUIS, MO.
The Basis for Effective Management of Lighting Energy
[PB-256070/4] N77-12544
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH [ENGLAND].
Digital computer aspects of the instrumentation and control of the new RAE 5 metre low speed tunnel
N77-11970
FORTRAN programs for the determination of aerodynamic derivatives from transient longitudinal or lateral responses of aircraft
[ARC-CP-1344] N77-12067
Eye protection, protective devices and visual aids
N77-12709
ROYAL INST. OF TECH., STOCKHOLM [SWEDEN].
A consistent finite-difference operator for time-dependent solution of steady, oblique shocks
[KTH-AERO-FI-47] N77-12331
ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 6, 1966
[KNMI-151-6] N77-12643
Marine climatological summaries for the Mediterranean and southern Indian Ocean, volume 7, 1967
[KNMI-151-7] N77-12644
Yearbook A, no. 126: Meteorology, 1974
[KNMI-97-126] N77-12645
Climatological data of Netherlands stations. Volume 9: Tables with data of aerodromes Amsterdam/Schiphol, Eindhoven/Eindhoven, Enschede/Twente, Groningen/Eelde, Maastricht/Zuid-Limburg and Rotterdam/Rotterdam according to observations in the period 1955 - 1970
[KNMI-150-9] N77-12646
ROYAL OBSERVATORY, EDINBURGH [SCOTLAND].
Spectrophotometry of cool stars in the near infrared. Part 3: Results for a region in the direction of l 2 = 138 deg
[ISBN-0-902553-13-5] N77-12957
RUTGERS UNIV., NEW BRUNSWICK, N.J.
Relationship between water quality and plant growth in ponds
[PB-256513/3] N77-12594

S

SANDIA LABS., ALBUQUERQUE, N.MEX.
A theoretical evaluation of rigid baffles in suppression of combustion instability
[NASA-CR-149167] N77-12158
SANDIA LABS., KIRTLAND AFB, N. MEX.
Protection from retinal burns and flashblindness due to atomic flash
N77-12711
SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Oxygen accumulation in hypobaric chambers
[AD-A025860] N77-12073
SCIENCE APPLICATIONS, INC., WESTLAKE VILLAGE, CALIF.
Air quality models required data characterization
[PB-255730/4] N77-12589
SCIENTIFIC TRANSLATION SERVICE, SANTA BARBARA, CALIF.
The effect of various air density-altitude relations on the phugoid
[NASA-TT-F-17118] N77-11990
Comparative analysis of designs and implementations of reaction flying vehicles proposed during the nineteenth and beginning of the twentieth centuries
[NASA-TT-F-16749] N77-12081
Entrance of mankind into space [15th anniversary of the first manned flight into space]
[NASA-TT-F-17114] N77-12082
Use and analysis of the scientific data from the INTASAT satellite
[NASA-TT-F-16738] N77-12094
General operations program Signe 3
[NASA-TT-F-16760] N77-12096
Determining the motion of space vehicles
[NASA-TT-F-17100] N77-12118
Analysis of liquid-propellant rocket engines designed by F. A. Tsander
[NASA-TT-F-16748] N77-12122
Process for manufacture of stable highly pure metals which form gaseous hydrides, such as silicon or germanium, by means of electrical discharges
[NASA-TT-F-16763] N77-12180
Report from space
[NASA-TT-F-17504] N77-12482
Method for isotope separation
[NASA-TT-F-16743] N77-12841

Optimization in the study of a sinusoidal waveform of known periodicity in the presence of noise. Application in radio astronomy, I
[NASA-TT-F-16764] N77-12955
SEMCOR, INC., MOORESTOWN, N.J.
A comparison of distributed control and command/response multiplex systems
[AD-A025105] N77-12264
SERVICE DE SANTE POUR L'ARMEE DE L'AIR, PARIS [FRANCE].
Flight fitness and pliant contact lenses
N77-12714
SHARP [GEORGE G.], INC., NEW YORK.
Exploding wire shock test facility
[AD-A024924] N77-12079
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT, CHRISTCHURCH [ENGLAND].
A binary to gray code converter for incorporation in a data modem
[SRDE-76002] N77-12249
SOCIETE NATIONALE D'ETUDE ET DE CONSTRUCTION DE MOTEURS D'AVIATION, VILLAROCHE [FRANCE].
Models for calculating flow in axial turbomachinery
N77-12014
SOLAR, SAN DIEGO, CALIF.
Development of erosion resistant claddings for helicopter rotor blades
[AD-A024894] N77-12054
NS-4 coating process development for columbium alloy airfoils
[AD-A025797] N77-12139
SOLAREX CORP., ROCKVILLE, MD.
Development of 20 percent efficient solar cell
[PB-255903/7] N77-12548
SOUTH CAROLINA UNIV., COLUMBIA.
Determination of the torsional barriers around single bonds by vibrational spectroscopy
N77-12153
Web-dendritic ribbon growth
[NASA-CR-149237] N77-12512
SOUTHAMPTON UNIV. [ENGLAND].
Application of the computer for on-site definition and control of wind tunnel shape for minimum boundary interference
N77-11975
A study of servo accelerometer design for low frequency vibration measurement
[ISVR-TR-85] N77-12369
Measurement of the motion of trees in two dimensions
[ISVR-TR-86] N77-12437
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS, LOS ANGELES
Transit safety and security: A design framework
[PB-256518/2] N77-12951
SOUTHERN RESEARCH INST., BIRMINGHAM, ALA.
Rapping reentrainment in a nearly full-scale pilot electrostatic precipitator
[PB-255984/7] N77-12595
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Blast pressures inside and outside suppressive structures
[AD-A025504] N77-12447
Methods of predicting blast loads inside and outside suppressive structures
[AD-A024906] N77-12466
SPECTROLAB, INC., SYLMAR, CALIF.
Low reflectivity solar cells
[AD-A025922] N77-12539
SPECTRONICS, INC., RICHARDSON, TEX.
Optoelectronic devices packaged for fiber optics application, volume 1
[AD-A025905] N77-12861
SPERRY SUPPORT SERVICES, HUNTSVILLE, ALA.
Analyses of ACPL thermal/fluid conditioning system
[NASA-CR-149166] N77-12333
SPERRY UNIVAC, ST. PAUL, MINN.
Reliability evaluation MNOS arrays
[AD-A025776] N77-12900
STANFORD RESEARCH INST., MENLO PARK, CALIF.
Photon interactions with atmospheric negative ions
[AD-A025770] N77-12163
Thermochemistry of gaseous metal oxides
[AD-A025661] N77-12164
Effect of sun angle, atmospheric attenuation, and turbulence on mirror beacons for LANDSAT image control
[PB-255404/6] N77-12488
Costs of alternative sources of electricity
[PB-255765/0] N77-12528
Impacts of synthetic liquid fuel development. Automotive market. Volume 1: Summary
[PB-255994/6] N77-12533
Impacts of synthetic liquid fuel development. Automotive market. Volume 2
[PB-255995/3] N77-12534
Applied mathematics
[AD-A025791] N77-12807
An initial study of current and projected publishing technology pertinent to the Navy Technical Manual System [NTMS]
[AD-A025744] N77-12926
STANFORD UNIV., CALIF.
Interprocess communication protocols for computer networks
[AD-A025508] N77-12254
ARPA internetwork protocols project
[AD-A024823] N77-12260
ARPA internetwork protocols project
[AD-A024819] N77-12261
TCP resynchronization
[AD-A024822] N77-12262
Advanced integrated-circuit technology for micropower ICs. Integrated circuits
[AD-A025507] N77-12303
Solid electrolyte battery materials
[AD-A024658] N77-12542
Two related goodness-of-fit problems with applications to spacings
[AD-A025699] N77-12808
Pearson curves revisited
[AD-A025696] N77-12809
A technique for detecting the number of populations falling within a total sample
[AD-A025701] N77-12820
A comparison of several attribute sampling plans
[AD-A025700] N77-12821
Estimation of parameters of zero-one processes by interval sampling
[AD-A025698] N77-12823
Limiting mechanisms in MHD generator performance
[AD-A025949] N77-12879
Biomedical technical transfer. Applications of NASA science and technology
[NASA-CR-149161] N77-12935
STATE UNIV. OF NEW YORK, BUFFALO.
Chloride management in Lake Erie Basin
[PB-256241/1] N77-12584
STATE UNIV. OF NEW YORK, SYRACUSE.
Marine waste disposal in the New York bight: Public policy, environmental impacts and alternative futures
[PB-255222/2] N77-12943
STEVENS INST. OF TECH., HOBOKEN, N.J.
Waves generated by a uniformly moving oscillatory surface effect ship
[AD-A025129] N77-12011
STRATEGIC AIR COMMAND, OFFUTT AFB, NEBR.
Summary and evaluation of theoretical developments relating to trailing wing tip vortices generated by aircraft
[AD-A025614] N77-12007
STUTTGART UNIV. [WEST GERMANY].
Bounds for effective elastic moduli of disordered materials. Part 1: Formal theory
N77-12438
Structural defects in solids
N77-12894
SWEDISH COUNCIL FOR BUILDING RESEARCH, STOCKHOLM.
Urban and regional research in Sweden 1974-1975. An annotated list
[PB-256201/5] N77-12949
SYRACUSE UNIV., N.Y.
A computer program for radiation from arbitrarily oriented wire antennas over imperfect ground
[AD-A025457] N77-12274
Elastic and quasi-elastic laser light scattering of photochromic macromolecules
N77-12383
Mask pattern generation techniques
N77-12745
An approach of developing fast transform algorithms
[AD-A024665] N77-12762
Parallel arithmetic using serial arithmetic processors
N77-12783
Uniform approximation of continuous functions on open subsets of R to the m power
N77-12786
Classification techniques appropriate for unequal covariance matrices
N77-12815
Investigation of vacuum deposition processes by optical emission spectroscopy
N77-12851
Analysis of carrier concentration and mobility in boron-doped silicon
N77-12886
SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
Evaluation of water quality models: A management guide for planners
[PB-256412/8] N77-12574
SYSTEMS SCIENCE AND SOFTWARE, LA JOLLA, CALIF.
Modified GRAY: An improved three-phase equation of state for metals
[AD-A025260] N77-12192
SYSTEMS TECHNOLOGY, INC., HAWTHORNE, CALIF.
Investigation of the use of an electronic multifunction display and an electromechanical horizontal situation indicator for guidance and control of powered-lift short-haul aircraft
[NASA-CR-137922] N77-12055

T

TECHNICAL UNIV. OF DENMARK, LYNGBY.
Numerical investigations of monopole antenna systems on conducting cylinders
[R-166] N77-12250
TECHNION RESEARCH AND DEVELOPMENT FOUNDATION LTD., HAIFA [ISRAEL].
Properties of electron gas in constant magnetic and electric fields
[AD-A025464] N77-12905
TECHNISCHE HOGESCHOOL, DELFT [NETHERLANDS].
Passive attitude stabilization of satellites
[VTH-176] N77-12100
TEKNEKRON, INC., BERKELEY, CALIF.
Assessment of the impact of proposed thermal effluent guidelines for the steam electric power industry
[PB-255937/5] N77-12587
TELEDYNE GEOTECHNICAL, ALEXANDRIA, VA.
Short-period P wave attenuation along various paths in North America as determined from P wave spectra of the SALMON nuclear explosion
[AD-A025239] N77-12622
TEMPLE UNIV., PHILADELPHIA, PA.
Some sequential designs for the selection of the best binomial population
N77-12813
A three phase model for controlled clinical trials
N77-12817
Kondo and magnetic ordering behavior in singlet ground state systems
N77-12891
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
Atmospheric flow over two-dimensional bluff surface obstructions
[NASA-CR-2750] N77-11996
Turbulent atmospheric flow over a backward-facing step
[NASA-CR-2749] N77-12639
TEXAS A&M UNIV., COLLEGE STATION.
Sunlight and the ocean
[AD-A024678] N77-12665
Square-root ratio estimation
[AD-A025241] N77-12802
Asymptotic radiance and polarization in optically thick media: Ocean and clouds
[AD-A025107] N77-12862
TEXAS UNIV., AUSTIN.
Effect of the constrictive area ratio on the rocket exhaust flow-field in the launcher
[AD-A024657] N77-12127
Desensitized specific optimal system design utilizing digital simulation by partitioning and uncoupling
[AD-A025775] N77-12777
TEXAS UNIV. AT DALLAS, RICHARDSON.
Contributions to paleomagnetism and rb-sr geochronology
N77-12605
TEXAS UNIV. HEALTH SCIENCE CENTER, SAN ANTONIO.
Spectral effects on cross-sectional reconstruction from X-rays
N77-12855
TEXTRON BELL AEROSPACE CO., BUFFALO, N.Y.
Fundamentals and applications of gas-particle flow
N77-12357
THOMSON-CSF, PARIS [FRANCE].
Solar out-of-ecliptic study. Volume 1: Executive summary
[ESS/SS-699-VOL-1] N77-12087
Solar out-of-ecliptic study. Volume 2: System analysis and definition
[ESS/SS-699-VOL-2] N77-12088
Solar out-of-ecliptic study. Volume 3: Subsystem analysis and definition
[ESS/SS-699-VOL-3] N77-12089
Solar out-of-ecliptic study: Volume 4: Development plan and cost estimates
[ESS/SS-699-VOL-4] N77-12090
Solar out-of-ecliptic study. Appendix: System specification
[ESS/SS-699-APP] N77-12091
TOKYO UNIV. [JAPAN].
Study of evaporation and condensation problems by kinetic theory, volume 41, no. 5
[ISAS-541] N77-12330
On the dynamic stress concentration of notched plates as induced by tensile stress waves, volume 41, no. 4
[ISAS-540] N77-12434
TORONTO UNIV. [ONTARIO].
Velocity measurements on the aerodynamic wake of a hovercraft using laser Doppler anemometry
[UTIAS-TN-203] N77-12010

TRANSEMANTICS, INC., WASHINGTON, D.C.
Approximating functions for earth atmospheric density
[NASA-TT-F-17107] N77-12608
TRANSPORTATION RESEARCH BOARD, WASHINGTON, D.C.
Instrumentation and equipment for testing highway materials, products, and performance
[PB-256138/9] N77-12377
TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Terrestrial radiodetermination potential users and their requirements
[PB-255839/3] N77-12035
TRI-STATE REGIONAL PLANNING COMMISSION, NEW YORK.
Urban densities for public transportation
[PB-256636/2] N77-12952
TRW, INC., LAWNDALE, CALIF.
Production engineering measure for an integrated circuit power amplifier 600 - 1000 MHz, for tactical radio equipment
[AD-A025919] N77-12307
TRW SYSTEMS GROUP, REDONDO BEACH, CALIF.
Heat pipe materials compatibility
[NASA-CR-135069] N77-12182

U

UNION CARBIDE CORP., SISTERSVILLE, W. VA.
Low cost silicon solar array project. Task 1: Establishment of the feasibility of a process capable of low cost, high volume production of silane, SiH4
[NASA-CR-149238] N77-12514
UNITED TECHNOLOGIES CORP., STRATFORD, CONN.
Validation of the rotorcraft flight simulation program [C81] for articulated rotor helicopters through correction with flight data
[AD-A025934] N77-12045
UNITED TECHNOLOGIES CORP., SUNNYVALE, CALIF.
Stress intensity factors for three-dimensional problems
[AD-A025802] N77-12460
UNITED TECHNOLOGIES CORP., WINDSOR LOCKS, CONN.
Advanced V/STOL propeller critical components investigation
[AD-A024663] N77-12063
Rocket engine assemblies and gas generator plenum
[AD-A025932] N77-12125
Development of hydrazine gas generator/plenum system
[AD-A025931] N77-12126
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Investigate fiber reinforced Si13N4
[AD-A025901] N77-12137
UNIVERSIDADE TECNICA DE LISBOA [PORTUGAL].
Weathering and weatherability of rocks: Experiments on thermal fatigue of non-igneous rocks
[AD-A025598] N77-12619
UNIVERSITY COLL., LONDON [ENGLAND].
University College London ARPANET project
[AD-A025293] N77-12253
UNIVERSITY OF SOUTH FLORIDA, TAMPA.
The behavior of the Pade table for the exponential
[AD-A025099] N77-12805
UNIVERSITY OF SOUTHERN CALIF., LOS ANGELES.
Temperature effects of crude oil in the upper intertidal zone
[PB-255956/5] N77-12581
UNIVERSITY OF SOUTHERN CALIF., MARINA DEL REY.
XED users manual. Beginning instruction
[AD-A025738] N77-12752
UOP, INC., DES PLAINES, ILL.
Optimization of PT-doped Kocite [trademark] electrodes in H3 PO4 fuel cells
[AD-A025326] N77-12529
USC/INFORMATION SCIENCES INST., MARINA DEL REY, CALIF.
Distributed computation study
[AD-A024670] N77-12774
UTAH STATE UNIV., LOGAN.
Intensity variations of atmospheric hydroxyl emissions
[AD-A025274] N77-12618
Geometric aspects of rocket photometry
[AD-A024947] N77-12629
UTAH UNIV., SALT LAKE CITY.
Digital color image processing and psychophysics within the framework of a human visual model
N77-12849
Technique development for complete electronic-structure calculations in crystalline solids
[AD-A025128] N77-12903
UTAH WATER RESEARCH LAB., LOGAN.
Development of a water quality simulation model applicable to Great Salt Lake, Utah
[PB-255718/9] N77-12596

V

VANDERBILT UNIV., NASHVILLE, TENN.
Preparation and magnetic properties of titanium phosphate glass
N77-12213
FORESTER: A language for morphological analysis of hierarchical systems, with reference to structural exegesis of the synoptic traditions
N77-12740
Pulse analysis of acoustic emission signals
N77-12831
VERMONT UNIV. AND STATE AGRICULTURAL COLL., BURLINGTON.
Radiofrequency studies of the effects of temperature on the electrical conductivity of clean and contaminated discontinuous metal films
N77-12289
VILLANOVA UNIV., PA.
The use of a prototype cryogenic gas chromatograph in combination with PTGC for analysis of inorganic and organic gases: Application to air pollution studies
N77-12144
Investigations of column packing materials for gas solid chromatography
N77-12147
Analytical applications of a high resolution echelle monochromator
N77-12151
VIRGINIA COMMONWEALTH UNIV., RICHMOND.
Topology in biology, the relationship of structure to function
N77-12666
VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL, CHARLOTTESVILLE.
Evaluation of temperature effects on bituminous pavement deflections in Virginia
[PB-255955/7] N77-12456
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Preparative high performance liquid chromatography
N77-12156
Mean flow and turbulence measurements in the wake of slender propeller-driven bodies including effects of pitch angle
[AD-A031088] N77-12337
Notes on the computation of the generalized zeta and digamma functions with programs and tables
[AD-A025134] N77-12707
VON KARMAN INST. FOR FLUID DYNAMICS, RHODE-SAINT-GENESE [BELGIUM].
The importance of experimentally-determined closure conditions in transonic blade-to-blade flows calculated by a time-dependent technique
N77-11983
Turbine test cases: Presentation of design and experimental characteristics
N77-12025
Turbines: Presentation of calculated data and comparison with experiments
N77-12026
Flow of solid particles in gases: Activities at the Von Karman Institute for Fluid Dynamics
N77-12356
VOUGHT CORP., DALLAS, TEX.
Development of a self contained heat rejection module, phase 2 and 3
[NASA-CR-151109] N77-12068
VOUGHT CORP. ADVANCED TECHNOLOGY CENTER, INC., DALLAS, TEX.
Linear noise-cancelling microphone
[AD-A025903] N77-12263
VRIJE UNIVERSITEIT, BRUSSELS [BELGIUM].
Finite element method for through-flow calculations
N77-12018

W

WASHINGTON STATE UNIV., PULLMAN.
Unusual five-coordinate complexes of transition metal ions
N77-12172
The numerical solution of the eigenvalue problem for integral operators using the method of projections
N77-12781
WASHINGTON UNIV., SEATTLE.
Improving the reliability of factor analysis of chemical data by utilizing the measured analytical uncertainty
[AD-A025951] N77-12169
Dynamic finite element and dynamic photoelastic analyses of crack arrest in homalite-100 plates
[AD-A025626] N77-12454
YALE UNIV., NEW HAVEN, CONN.
Induced representations and positive linear maps of ordinary C-algebras
N77-12787
The parabolic cylinder functions of Miller's second kind for complex parameter
[AD-A025314] N77-12801
WATERVLIET ARSENAL, N.Y.
Literature review: Impact toughness of bainite versus martensite
[AD-A025858] N77-12189
Variation of mechanical properties in large steel forgings
[AD-A025807] N77-12208
WEBB ASSOCIATES, YELLOW SPRINGS, OHIO.
Sampling and data gathering strategies for future USAF anthropometry
[AD-A025240] N77-12697
Statistical concepts in design
[AD-A025750] N77-12699
WEIDLINGER ASSOCIATES, MENLO PARK, CALIF.
Pretest prediction of dynamic structural response to ground motion event ESSEX-5
[AD-A023911] N77-12440
WESLEYAN UNIV., MIDDLETOWN, CONN.
Purity and imbeddedness in Abelian torsion groups
N77-12826
Symbolic transformation groups
N77-12827
WEST VIRGINIA UNIV., MORGANTOWN.
The collection, analysis, and comparison of human sensible perspiration between sedentary and conditioned male caucasians as to the variation in selected electrolyte composition
N77-12669
WESTFIELD COLL., LONDON [ENGLAND].
Spin dependence at very high energies in an eikonal picture of pp elastic scattering
N77-12842
Two particle unitary for helicity amplitudes with particles of arbitrary spin
N77-12843
WESTINGHOUSE RESEARCH LABS., PITTSBURGH, PA.
Thin film solar cells for terrestrial applications
[PB-255606/6] N77-12553
WHITE SANDS MISSILE RANGE, N.MEX.
An adaptive prediction filter algorithm for optimizing servo system performance
[AD-A025980] N77-12873
WILLIAMS COLL., WILLIAMSTOWN, MASS.
Comparison of computer simulation models with field data from nearshore environments
[AD-A025682] N77-12734
WISCONSIN UNIV., MADISON.
Ionization processes relevant to the formation of new materials
[AD-A025197] N77-12130
Increased fuel economy in transportation systems by use of energy management: Second year's program. Executive summary
[PB-256117/3] N77-12536
WISCONSIN UNIV., MILWAUKEE.
Space-time trade-offs in structured programming
[AD-A025599] N77-12748
WITWATERSRAND UNIV., JOHANNESBURG [SOUTH AFRICA].
Optimum compression ratios of Stirling cycle machines
[REPT-68] N77-12405
The behaviour of skin temperature profiles in the forearm of a nude resting subject at air temperatures from 24 C to 34 C
[REPT-69] N77-12681
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Working Conference on Oceanographic Data Systems
[AD-A025475] N77-12663
WORLD METEOROLOGICAL ORGANIZATION, GENEVA [SWITZERLAND].
Review of present knowledge of plant injury by air pollution
[WMO-431] N77-12559
Application of building climatology to the problems of housing and building for human settlements
[WMO-441] N77-12640

X

XONICS, INC., VAN NUYS, CALIF.
Air quality models required data characterization
[PB-255730/4] N77-12589

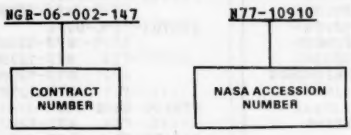
Y

YALE UNIV., NEW HAVEN, CONN.
Unsteady transonic flow with heat addition due to condensation
[AD-A025651] N77-12350

YUMA PROVING GROUND, ARIZ.
Remote portable solar powered microwave system
[AD-A025978] N77-12556

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

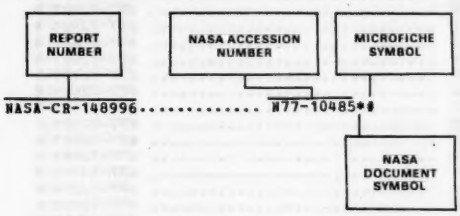
AF PROJ. 120-2
N77-12197
AF PROJ. 486U
N77-12194
AF PROJ. 649L
N77-12901
AF PROJ. 668A
N77-12061
AF PROJ. 1256
N77-12393
AF PROJ. 1279
N77-12765
AF PROJ. 1370
N77-12012
N77-12342
AF PROJ. 1900
N77-12603
AF PROJ. 1929
N77-12008
AF PROJ. 1955
N77-12727
AF PROJ. 2001
N77-12317
N77-12392
AF PROJ. 2004
N77-12374
AF PROJ. 2052
N77-12772
AF PROJ. 2104
N77-12047
N77-12077
AF PROJ. 2646
N77-12870
AF PROJ. 3048
N77-12412
AF PROJ. 3066
N77-12446
AF PROJ. 3145
N77-12539
N77-12541
N77-12879
AF PROJ. 3326
N77-12074
N77-12078
N77-12866
AF PROJ. 4363
N77-12448
AF PROJ. 4506
N77-12252
AF PROJ. 4540
N77-12304
N77-12305
AF PROJ. 4603
N77-12623
AF PROJ. 4643
N77-12617
N77-12628
AF PROJ. 5519
N77-12226
N77-12900
N77-12911
AF PROJ. 5534
N77-12373
AF PROJ. 5550
N77-12774
AF PROJ. 5569
N77-12498
AF PROJ. 5573
N77-12312
N77-12315
N77-12316
AF PROJ. 5581
N77-12762
AF PROJ. 5635
N77-12274
AF PROJ. 6095
N77-12390
AF PROJ. 6244
N77-12401
AF PROJ. 6302
N77-12233
AF PROJ. 6665
N77-12649
AF PROJ. 6813
N77-12350
N77-12903
AF PROJ. 7065
N77-12347
AF PROJ. 7071
N77-12824
AF PROJ. 7184
N77-12697
N77-12699
AF PROJ. 7222
N77-12691
N77-12703
AF PROJ. 7231
N77-12690
AF PROJ. 7233
N77-12051
N77-12487
AF PROJ. 7260
N77-12880
AF PROJ. 7340
N77-12188
N77-12200
N77-12222
N77-12223
N77-12442
AF PROJ. 7342
N77-12135
N77-12138
N77-12445
AF PROJ. 7351
N77-12048
N77-12191
N77-12195
N77-12196
N77-12209
N77-12210
N77-12419
AF PROJ. 7353
N77-12193
N77-12199
AF PROJ. 7381
N77-12198
AF PROJ. 7600
N77-12626
AF PROJ. 7605
N77-12648
AF PROJ. 7639
N77-12836
AF PROJ. 7646
N77-12374
AF PROJ. 7659
N77-12117
AF PROJ. 7663
N77-12258
N77-12630
AF PROJ. 8809
N77-12053
AF PROJ. 9538
N77-12130
N77-12170
AF PROJ. 9711
N77-12106
N77-12128
N77-12350
AF PROJ. 9749
N77-12467
N77-12805
N77-12810
AF PROJ. 9761
N77-12207
AF PROJ. 9763
N77-12903
AF PROJ. 9769
N77-12779
N77-12811
AF-AFOSR-1937-70
N77-12350
AF-AFOSR-1972-71
N77-12130
AF-AFOSR-1992-71
N77-12903
AF-AFOSR-2063-71
N77-12467
AF-AFOSR-2091-71
N77-12010
AF-AFOSR-2142-71
N77-12628
AF-AFOSR-2273-72
N77-12779
AF-AFOSR-2406-72
N77-12647
AF-AFOSR-2629-74
N77-12170
AF-AFOSR-2688-74
N77-12805
AF-AFOSR-2729-74
N77-12805
AF-AFOSR-2794-75
N77-12128
AF-AFOSR-2795-75
N77-12811
AFPEA PROJ. 72-P7-17(6A)
N77-12418
ARO PROJ. V32S-69A
N77-12237
ARO PROJ. V37A-32A
N77-12076
ARO PROJ. V41R-01A
N77-12237
ARPA ORDER 512
N77-12627
ARPA ORDER 1279
N77-12280
N77-12389
N77-12395
N77-12765
ARPA ORDER 1620
N77-12622
ARPA ORDER 1806
N77-12399
N77-12400
ARPA ORDER 1872
N77-12819
ARPA ORDER 1910
N77-12337
ARPA ORDER 2221
N77-12647
ARPA ORDER 2223
N77-12752
ARPA ORDER 2327
N77-12874
ARPA ORDER 2415
N77-12411
ARPA ORDER 2466
N77-12735
ARPA ORDER 2494
N77-12254
N77-12260
N77-12261
N77-12262
ARPA ORDER 2504
N77-12807
ARPA ORDER 2618
N77-12896
ARPA ORDER 2646
N77-12870
ARPA ORDER 2901
N77-12766
ARPA ORDER 3080
N77-12372
AT(04-3)-878 N77-12284
N77-12881
AT(49-16)3003
N77-12916
AT(49-24)-0207
N77-12461
AT(49-24)-0230
N77-12345
N77-12346
CG PROG. 761140
N77-12034
CNR-73.00350.07
N77-12298
DA PROJ. DM1-61102-B-52B
N77-12619
DA PROJ. 1F1-61102-AH-45
N77-11999
DA PROJ. 1F2-62205-AH-88
N77-12046
DA PROJ. 1F2-62208-AH-90
N77-12045
N77-12052
DA PROJ. 1F2-62209-AH-76
N77-12066
DA PROJ. 1G1-62207-AA-72
N77-12063
DA PROJ. 1G7-62708-AH-67
N77-12529
DA PROJ. 1M3-62303-A-214
N77-12320
DA PROJ. 1S3-22152-D-690
N77-12142
DA PROJ. 1S7-62605-AH-94
N77-12313
DA PROJ. 1S7-62701-AH-92
N77-12259
DA PROJ. 1S7-62705-AH-94
N77-12308
DA PROJ. 1S7-62705-AH-94D
N77-12301
DA PROJ. 1S7-62705-AH-94P
N77-12306
DA PROJ. 1S7-63707-D-437
N77-12263
DA PROJ. 1T0-62105-AH-328
N77-12212
DA PROJ. 1T1-61102-A-31C
N77-12388
DA PROJ. 1T1-61102-A-148B
N77-12912
DA PROJ. 1T1-61102-AH-42
N77-12463
DA PROJ. 1T1-61102-B-11B
N77-12162
N77-12905
DA PROJ. 1T1-61102-B-53A
N77-12386
N77-12625
DA PROJ. 1T1-62105-AH-84
N77-12206
DA PROJ. 1T1-62111-AH-71
N77-12655
N77-12865
DA PROJ. 1T1-6110213-B-32D
N77-12143
DA PROJ. 1T1-61102832D
N77-12190
DA PROJ. 1T7-62709-D-048
N77-12570
DA PROJ. 1W0-62113-A-661
N77-12141

DA PROJ. 1W1-62113-A-659
N77-12192
DA PROJ. 1W1-62118-AH-75
N77-12728
DA PROJ. 1W3-62303-A-214
N77-12006
N77-12102
DA PROJ. 1X3-64307-D-212
N77-12104
DA PROJ. 200-41102-A-14D
N77-12796
DA PROJ. 200-61102-A-14D
N77-12770
DA PROJ. 4A1-61102-AT-24
N77-12489
DA PROJ. 4A7-62719-AT-01
N77-12736
DA-ARO(D)-31-124-70-G44
N77-12910
DA-ARO(D)-31-124-73-G16
N77-12845
DA-ARO(D)-31-124-73-G47
N77-12907
DA-ARO(D)-31-124-73-G67
N77-12909
DA-ARO(D)-31-124-73-G99
N77-12908
DA-ARO(D)-31-124-73-G124
N77-12910
DA-ERO-75-G-02
N77-12162
DA-ERO-75-G-018
N77-12143
DA-ERO-75-G-061
N77-12905
DA-ERO-124-74-G0055
N77-12619
DAAA05-75-C-0083
N77-12466
DAAA09-75-C-2022
N77-12421
DAAA15-75-C-0083
N77-12447
DAAA15-75-C-0199
N77-12570
DAAB05-72-C-5844
N77-12307
DAAB07-71-C-0183
N77-12279
DAAB07-72-C-0229
N77-12303
DAAB07-72-C-0259
N77-12116
N77-12725
N77-12726
N77-12747
N77-12895
DAAB07-74-C-0568
N77-12306
DAAB07-75-C-0140
N77-12263
DAAB07-75-C-1305
N77-12301
DAAB07-75-C-1346
N77-12036
DAAB07-75-C-1368
N77-12308
DAAB07-76-C-0008
N77-12323
DAAB07-76-C-0332
N77-12259
DAAD05-74-C-0751
N77-12466
DAAD05-74-C-0770
N77-12192
DAAG39-75-C-0059
N77-12341
DAAG46-73-C-0256
N77-12141
DAAG46-74-C-0054
N77-12054
DAAG46-74-C-0089
N77-12139
DAAG53-76-C-0014
N77-12529
DAAG53-76-P-0559
N77-12101
DAAH01-73-C-1016
N77-12127
DAAH01-75-C-0953
N77-12283
DAAH01-75-C-1212
N77-12863
DAAJ02-72-C-0012
N77-12063
DAAJ02-74-C-0019
N77-12046
DAAJ02-74-C-0046
N77-12045
DAAJ02-74-C-0066
N77-12052
DAHC04-69-C-0062
N77-12140
DAHC04-73-C-0016
N77-12163
DAHC04-74-C-0018
N77-12802
DAHC04-74-C-0030
N77-12803
DAHC04-74-G-0179
N77-12748
DAHC04-75-C-0198
N77-12864
DAHC04-75-G-0027
N77-12907
DAHC04-75-G-0084
N77-12845
DAHC04-75-G-0150
N77-12770
N77-12796
DAHC15-72-C-0308
N77-12752
DAHC15-73-C-0200
N77-12931
DAHC15-73-C-0368
N77-12771
DAHC15-73-C-0370
N77-12807
DAJA37-74-C-1309
N77-12190
DAMD17-74-C-4122
N77-12732
DARPA ORDER 3097
N77-12387
N77-12664
N77-12994
DI-BM-GO-254028
N77-12499
DI-BM-HO-357079
N77-12322
DI-13-41-0001-5006
N77-12582
DI-14-01-0001-1845
N77-12544
DI-14-01-0001-2115
N77-12592
DI-14-03-6101N
N77-12526
DI-14-03-6108N
N77-12528
DI-14-08-001-14897
N77-12488
DI-14-21-0001-TR-72
N77-12939
DI-14-31-0001-3713
N77-12940
N77-12941
DI-14-31-0001-3888
N77-12563
DI-14-31-0001-4006
N77-12582
DI-14-31-0001-4017
N77-12938
DI-14-31-0001-4030
N77-12594
DI-14-31-0001-4084
N77-12563
DI-14-31-0001-5017
N77-12938
DI-14-31-0001-5045
N77-12596
DI-14-31-0001-5059
N77-12584
DNA PROJ. NWED-QAXEA094
N77-12624
DNA PROJ. NWED-QAXHE043
N77-12286
DNA PROJ. NWED-QAXMC912
N77-12667
DNA PROJ. NWED-QAXSC061
N77-12440
DNA PROJ. NWED-QAXTA026
N77-12257
DNA PROJ. NWED-QAXTA040
N77-12902
DNA PROJ. NWED-QAXTD043
N77-12904
DNA PROJ. NWER-QAXEB075
N77-12324
DNA PROJ. NWET-K43AAXHX604
N77-12629
DNA001-74-C-0019
N77-12286
DNA001-74-C-0254
N77-12440
DNA001-75-C-0094
N77-12624
DOT-CG-23223-A
N77-12425
N77-12573
DOT-CG-51487-A
N77-12572
DOT-OS-30112 N77-12536
DOT-TSC-1026-1
N77-12729
DOT-TSC-1026-2
N77-12730
DOT-UT-50016 N77-12945
DOT-UT-60006 N77-12946
DRME-74-118 N77-12001
DTEN-75-70-122
N77-12407
DTEN/STEN-75-70-122
N77-12408
E(11-1)-2075 N77-12805
EPA-P-005160-01
N77-12937
EPA-R-800398 N77-12575
EPA-R-802214 N77-12599
EPA-R-803201 N77-12537
EPA-68-01-2476
N77-12576
EPA-68-01-2641
N77-12574
EPA-68-01-2824
N77-12585
EPA-68-01-2963
N77-12566
EPA-68-01-3598
N77-12561
EPA-68-02-0287
N77-12167
EPA-68-02-1270
N77-12167
EPA-68-02-1323
N77-12501
EPA-68-02-1343
N77-12567
EPA-68-02-1354
N77-12580
EPA-68-02-1496
N77-12601
EPA-68-02-1728
N77-12562
EPA-68-02-1875
N77-12595
EPA-68-02-2076
N77-12583
EPA-68-02-2112
N77-12231
EPA-68-03-2016
N77-12533
N77-12534
ESA-SC/88-HQ N77-12087
N77-12088
N77-12089
N77-12090
N77-12091
ESOC-753/75-T
N77-12093
ESRO-SC/29-HQ
N77-12251
ESTEC-2290/74-HP
N77-12250
ESTEC-2328/74-HP
N77-12769
FEA-C-04-50041-00
N77-12587
FEA-CO-50171-00
N77-12545
FEA-CR-05-60593-00
N77-12531
N77-12532
F04611-75-C-0027
N77-12460
F04701-75-C-0076
N77-12105
N77-12754
N77-12868
N77-12989
F08606-76-C-0004
N77-12622
F19628-70-C-0035
N77-12880
F19628-72-C-0089
N77-12258
F19628-73-C-0047
N77-12274
F19628-73-C-0150
N77-12164
F19628-74-C-0039
N77-12649
F19628-74-C-0065
N77-12836
F19628-74-C-0085
N77-12653
F19628-74-C-0130
N77-12629
F19628-74-C-0190
N77-12618
F19628-74-C-0812
N77-12896
F19628-75-C-0015
N77-12630
F19628-75-C-0084
N77-12117
F19628-75-C-0099
N77-12617
F19628-75-C-0110
N77-12411
F19628-75-C-0170
N77-12257
F19628-76-C-0002
N77-12302
N77-12627
N77-12901
F19628-76-C-0010
N77-12626
F29601-74-C-0022
N77-12287
F29601-74-C-0119
N77-12393
F29601-75-C-0002
N77-12077
F29601-75-C-0040
N77-12078
F29601-75-C-0069
N77-12310
F30602-72-C-0417
N77-12280
N77-12395
F30602-72-C-0418
N77-12304
N77-12305
F30602-73-C-0065
N77-12300
F30602-73-C-0282
N77-12911
F30602-74-C-0082
N77-12389
F30602-74-C-0158
N77-12316
F30602-74-C-0160
N77-12226
F30602-74-C-0237
N77-12900
F30602-74-C-0294
N77-12749
F30602-74-C-0304
N77-12315
F30602-74-C-0335
N77-12762
F30602-75-C-0026
N77-12870

F30602-75-C-0068 N77-12312
F30602-75-C-0074 N77-12373
F30602-75-C-0222 N77-12774
F30602-75-C-0293 N77-12401
F30602-76-C-0022 N77-12765
F30602-76-C-0108 N77-12498
F33615-72-C-1030 N77-12197
F33615-72-C-1088 N77-12879
F33615-72-C-1213 N77-12824
F33615-73-C-1127 N77-12390
F33615-73-C-4002 N77-12690
F33615-73-C-4066 N77-12697
F33615-73-C-4121 N77-12705
F33615-73-C-5097 N77-12196
F33615-73-C-5102 N77-12135
F33615-73-C-5112 N77-12445
F33615-73-C-5113 N77-12228
F33615-73-C-5146 N77-12138
F33615-74-C-1014 N77-12392
F33615-74-C-1099 N77-12033
F33615-74-C-1208 N77-12317
F33615-74-C-2044 N77-12539
F33615-74-C-3072 N77-12008
F33615-74-C-4014 N77-12686
F33615-74-C-4033 N77-12051
F33615-74-C-5172 N77-12209
F33615-75-C-1004 N77-12347
F33615-75-C-1133 N77-12772
F33615-75-C-2061 N77-12412
F33615-75-C-3042 N77-12194
F33615-75-C-3102 N77-12012 N77-12342
F33615-75-C-5003 N77-12699
F33615-75-C-5041 N77-12198
F33615-75-C-5093 N77-12223
F33615-75-C-5138 N77-12193
F33615-75-C-5156 N77-12448
F33615-75-C-5169 N77-12199
F33657-73-C-0619 N77-12061
F40600-72-M-0002 N77-12916
F44620-70-C-0116 N77-12357
F44620-71-C-0091 N77-12777
F44620-73-C-0011 N77-12929
F44620-73-C-0074 N77-12735
F44620-74-C-0041 N77-12106
F44620-75-C-0018 N77-12207
F44620-75-C-0058 N77-12810
HDL PROJ. 302431 N77-12341
JPL-954219 N77-12123
JPL-954328 N77-12524
JPL-954334 N77-12514
JPL-954344 N77-12512
JPL-954355 N77-12515
JPL-954372 N77-12516
MAT PROJ. 03L-000 N77-12800
MDA903-76-C-0093 N77-12254 N77-12260 N77-12261 N77-12262
MDA903-76-C-0099 N77-12664
MDA903-76-C-0254 N77-12387 N77-12994
NASA ORDER S-70243-AG N77-12473
NASA ORDER W-13183 N77-12986
NASW-2558 N77-12476 N77-12477 N77-12478 N77-12634 N77-12635 N77-12636 N77-12637
NASW-2789 N77-12057
NASW-2790 N77-12080 N77-12095 N77-12479 N77-12508
NASW-2791 N77-11990 N77-12082 N77-12094 N77-12096 N77-12118 N77-12482 N77-12955
NASW-2792 N77-12608
NAS1-11257 N77-12620
NAS1-12954 N77-12039
NAS1-13129 N77-12620
NAS1-13931 N77-12133
NAS2-7615 N77-12040
NAS2-8973 N77-12055
NAS3-19128 N77-12182
NAS3-19522 N77-12041
NAS3-19716 N77-12510
NAS3-19721 N77-12181
NAS3-19747 N77-12230
NAS5-11074 N77-12620
NAS5-11431 N77-12620
NAS5-20492 N77-12361
NAS5-20539 N77-12620
NAS5-20907 N77-12474
NAS5-22399 N77-12472 N77-12475
NAS7-100 N77-12081 N77-12115 N77-12122 N77-12123 N77-12180 N77-12244 N77-12292 N77-12509 N77-12512 N77-12513 N77-12514 N77-12515 N77-12516 N77-12524 N77-12788 N77-12841
NAS8-28991 N77-12083
NAS8-29584 N77-11996 N77-12639
NAS8-29877 N77-12954
NAS8-30247 N77-12638
NAS8-31293 N77-12507
NAS8-31381 N77-12084
NAS8-31912 N77-12113
NAS8-31996 N77-12859
NAS8-32014 N77-12368
NAS8-32016 N77-12333
NAS9-10261 N77-12243
NAS9-13247 N77-12108 N77-12109 N77-12110 N77-12111
NAS9-13870 N77-12680
NAS9-14203 N77-12112
NAS9-14401 N77-12365
NAS9-14408 N77-12068
NAS9-14651 N77-12120
NAS9-15014 N77-12364
NBS-5-35924 N77-12737
NELC PROJ. A107 N77-12037
NGL-05-007-190-S4 N77-12989
NGL-16-001-002 N77-12620
NGL-22-009-383 N77-12019
NGR-05-020-634 N77-12935
NGR-06-002-095 N77-12158
NGR-09-010-085 N77-12064
NGR-33-010-082 N77-12988
NGR-36-009-017 N77-12029 N77-12030 N77-12606
NOAA-04-3-158-30 N77-12600
NR PROJ. 017-308 N77-12897
NR PROJ. 032-554 N77-12325
NR PROJ. 042-267 N77-12808 N77-12809 N77-12820 N77-12821 N77-12823
NR PROJ. 042-285 N77-12288
NR PROJ. 042-331 N77-12822
NR PROJ. 044-422 N77-12754
NR PROJ. 047-048 N77-12798 N77-12828
NR PROJ. 047-408 N77-12797
NR PROJ. 051-565 N77-12169
NR PROJ. 056-555 N77-12542
NR PROJ. 061-197 N77-12707
NR PROJ. 062-481 N77-12337
NR PROJ. 064-410 N77-12136
NR PROJ. 064-436 N77-12915
NR PROJ. 064-478 N77-12454
NR PROJ. 083-036 N77-12665 N77-12862
NR PROJ. 083-287 N77-12651
NR PROJ. 098-038 N77-12340
NR PROJ. 105-832 N77-12702
NR PROJ. 105-841 N77-12689
NR PROJ. 213-120 N77-12871
NR PROJ. 388-092 N77-12734
NRL PROJ. H02-29A N77-12284 N77-12881
NRL PROJ. M01-40 N77-12461
NRL PROJ. R02-86 N77-12278
NRL PROJ. R07-34 N77-12319
NSF AER-74-14718-A01 N77-12553
NSF AER-75-19576 N77-12546
NSF AER-75-19712 N77-12553
NSF AER-76-01823 N77-12550
NSF ATA-74-18173 N77-12410
NSF C-878 N77-12927
NSF DCR-72-01206 N77-12773
NSF DMR-72-03019 N77-12225
NSF DMR-75-18134 N77-12538
NSF ENG-74-18623 N77-12880
NSF ENG-74-22159 N77-12796
NSF ENG-75-10225 N77-12770
NSF GA-34148 N77-12989
NSF GI-43090 N77-12548
NSF GJ-40584 N77-12726
NSF MCS-75-222-55 N77-12754
NSF MPS-73-08534 N77-12828
NSG-1148 N77-12367
NSG-2119 N77-12695
NSG-3048 N77-12058
NSG-3077 N77-12403
NSG-7129 N77-12987
NUSC PROJ. A-385-10 N77-12227
N00014-67-A-0094-0019 N77-12985
N00014-67-A-0112-0085 N77-12808 N77-12820 N77-12821 N77-12823
N00014-67-A-0226 N77-12357
N00014-67-A-0242-0007 N77-12913
N00014-67-A-0298-0012 N77-12897
N00014-67-A-0406 N77-12835
N00014-68-A-0308-0002 N77-12665
N00014-69-C-0151 N77-12734
N00014-72-A-0136-0001 N77-12707
N00014-72-C-0345 N77-12692
N00014-73-C-0040 N77-12689
N00014-73-C-0199 N77-12107
N00014-73-C-0263 N77-12874
N00014-73-C-0402 N77-12079
N00014-74-C-0184 N77-12871
N00014-74-C-0280 N77-12253
N00014-75-C-0033 N77-12272
N00014-75-C-0061 N77-12400
N00014-75-C-0064 N77-12399
N00014-75-C-0148 N77-12915

N00014-75-C-0158 N77-12452 N77-12453
N00014-75-C-0262 N77-12651
N00014-75-C-0448 N77-12011
N00014-75-C-0476 N77-12878
N00014-75-C-0518 N77-12819
N00014-75-C-0528 N77-12288
N00014-75-C-0536 N77-12169
N00014-75-C-0537 N77-12665 N77-12862
N00014-75-C-0555 N77-12822
N00014-75-C-0621 N77-12797 N77-12798 N77-12828
N00014-75-C-0643 N77-12750
N00014-75-C-0707 N77-12325
N00014-75-C-0763 N77-12337
N00014-75-C-0764 N77-12028
N00014-75-C-0773 N77-12766
N00014-75-C-0888 N77-12221
N00014-75-C-0891 N77-12396
N00014-75-C-1012 N77-12211
N00014-75-C-1056 N77-12542
N00014-75-C-1077 N77-12702
N00014-75-C-1078 N77-12125 N77-12126
N00014-75-C-1143 N77-12340
N00014-76-C-0016 N77-12620
N00014-76-C-0060 N77-12454
N00014-76-C-0201 N77-12229
N00014-76-C-0240 N77-12136
N00014-76-C-0370 N77-12754
N00014-76-C-0407 N77-12926
N00014-76-C-0441 N77-12372
N00014-76-C-0445 N77-12451
N00017-72-C-4401 N77-12731
N00017-73-C-1418 N77-12201 N77-12344 N77-12464 N77-12919
N00019-75-C-0170 N77-12420
N00024-75-C-4112 N77-12321
N00039-73-C-0030 N77-12668
N00039-75-C-0289 N77-12281
N00123-73-C-1200 N77-12801
N00123-74-C-1411 N77-12867
N00123-76-C-0424 N77-12757
N00163-73-C-0544 N77-12861
N00228-75-C-2120 N77-12654
N60921-76-C-0073 N77-12391
N61339-76-C-0007 N77-12075
N62269-74-C-0761 N77-12264
N62269-75-C-0137 N77-12137
N66001-74-C-0035 N77-12819
N66001-75-C-0224 N77-12819
N66314-73-C-1770 N77-12656
PHS-HV-30011 N77-12220
PHS-72-2707 N77-12761
PROJ. SQUID N77-12340 N77-12357
PROJ. THEMIS N77-12880
RF12151403 N77-12278
SRI PROJ. PYU-2536 N77-12163
SRI PROJ. 4175-2 N77-12488
SRI PROJ. 4739 N77-12926
SRI PROJ. 4963-100 N77-12528
SR0230101 N77-12011
TP-6AC017 N77-12942
W-7405-ENG-48 N77-12506 N77-12525 N77-12722 N77-12790
WP57571301 N77-12232
XP21222035 N77-12319
YP57572002 N77-12564
ZR0000101 N77-12227 N77-12806
ZR00001010 N77-12800
177-32-83-00-72 N77-12767
198-30-02-02 N77-12609
505-01 N77-12185
505-02-13-01 N77-12027
505-02-21-01 N77-12435
505-02-41-01 N77-12218
505-03-11-02 N77-11989
505-04-11 N77-12069
505-04-11-01 N77-11998
505-05 N77-12000
505-06-31 N77-11993
505-06-42-01 N77-12071
505-06-93-04 N77-12032
505-10-21-03 N77-11999
505-10-23-01 N77-12066
505-10-41-03 N77-11995
505-11-31-02 N77-11994
506-16-36-07 N77-12119
506-17-25-01 N77-12436
506-21 N77-12099
514-52-01-03 N77-11968
743-01-12-02 N77-12610
743-01-13-01 N77-11992
743-04-12-02 N77-11997 N77-12065
986-16-00-00-72 N77-12092

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterick (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche. Accession numbers followed by a plus sign (+) are not available on microfiche because of size or reproducibility.

A-5944 ..... N77-11993*#
A-6813 ..... N77-12069*#

AAI-2332-FR ..... N77-12737 #

AAMRC-CTR-76-8 ..... N77-12139 #

AD-A019433 ..... N77-12300 #
AD-A021526 ..... N77-12033 #
AD-A023841 ..... N77-12034 #
AD-A023911 ..... N77-12440 #
AD-A024276 ..... N77-12647 #
AD-A024279 ..... N77-12819 #
AD-A024280 ..... N77-12301 #
AD-A024657 ..... N77-12127 #
AD-A024658 ..... N77-12542 #
AD-A024661 ..... N77-12571 #
AD-A024662 ..... N77-12052 #
AD-A024663 ..... N77-12063 #
AD-A024664 ..... N77-12226 #
AD-A024665 ..... N77-12762 #
AD-A024666 ..... N77-12319 #
AD-A024667 ..... N77-12227 #
AD-A024670 ..... N77-12774 #
AD-A024671 ..... N77-12282 #
AD-A024672 ..... N77-12142 #
AD-A024673 ..... N77-12320 #
AD-A024678 ..... N77-12665 #
AD-A024702 ..... N77-12652 #
AD-A024706 ..... N77-12630 #
AD-A024708 ..... N77-12201 #
AD-A024709 ..... N77-12689 #
AD-A024710 ..... N77-12651 #
AD-A024711 ..... N77-12451 #
AD-A024714 ..... N77-12579 #
AD-A024715 ..... N77-12463 #
AD-A024718 ..... N77-12310 #
AD-A024719 ..... N77-12393 #
AD-A024720 ..... N77-12626 #
AD-A024722 ..... N77-12138 #
AD-A024726 ..... N77-12688 #
AD-A024727 ..... N77-12042 #
AD-A024732 ..... N77-12075 #
AD-A024733 ..... N77-12141 #
AD-A024736 ..... N77-12654 #
AD-A024737 ..... N77-12340 #
AD-A024741 ..... N77-12379 #
AD-A024743 ..... N77-12168 #
AD-A024752 ..... N77-12904 #
AD-A024760 ..... N77-12427 #
AD-A024762 ..... N77-12388 #
AD-A024764 ..... N77-12804 #
AD-A024768 ..... N77-12309 #
AD-A024770 ..... N77-12287 #
AD-A024778 ..... N77-12237 #
AD-A024779 ..... N77-12312 #
AD-A024780 ..... N77-12198 #
AD-A024785 ..... N77-12457 #
AD-A024786 ..... N77-12543 #
AD-A024792 ..... N77-12754 #
AD-A024803 ..... N77-12276 #
AD-A024804 ..... N77-12866 #
AD-A024806 ..... N77-12985 #
AD-A024809 ..... N77-12311 #
AD-A024811 ..... N77-12375 #
AD-A024813 ..... N77-12450 #
AD-A024815 ..... N77-12413 #
AD-A024819 ..... N77-12261 #
AD-A024822 ..... N77-12262 #
AD-A024823 ..... N77-12260 #
AD-A024863 ..... N77-12389 #
AD-A024889 ..... N77-12265 #
AD-A024893 ..... N77-12417 #
AD-A024894 ..... N77-12054 #
AD-A024895 ..... N77-12931 #
AD-A024896 ..... N77-12053 #
AD-A024906 ..... N77-12466 #
AD-A024909 ..... N77-12764 #
AD-A024910 ..... N77-12465 #
AD-A024918 ..... N77-12911 #
AD-A024922 ..... N77-12284 #
AD-A024924 ..... N77-12079 #
AD-A024925 ..... N77-12078 #
AD-A024927 ..... N77-12351 #
AD-A024930 ..... N77-12763 #
AD-A024936 ..... N77-12880 #
AD-A024937 ..... N77-12928 #
AD-A024938 ..... N77-12736 #
AD-A024939 ..... N77-12667 #
AD-A024940 ..... N77-12206 #
AD-A024942 ..... N77-12756 #
AD-A024943 ..... N77-12313 #
AD-A024947 ..... N77-12629 #
AD-A024948 ..... N77-12140 #
AD-A024949 ..... N77-12909 #
AD-A024951 ..... N77-12836 #
AD-A024952 ..... N77-12653 #
AD-A024955 ..... N77-12668 #
AD-A024956 ..... N77-12286 #
AD-A024957 ..... N77-12628 #
AD-A024960 ..... N77-12871 #
AD-A024963 ..... N77-12143 #
AD-A024966 ..... N77-12735 #
AD-A024969 ..... N77-12077 #
AD-A024971 ..... N77-12750 #
AD-A024972 ..... N77-12751 #
AD-A024977 ..... N77-12102 #
AD-A024978 ..... N77-12006 #
AD-A024979 ..... N77-12825 #
AD-A024981 ..... N77-12910 #
AD-A024984 ..... N77-12128 #
AD-A024985 ..... N77-12464 #
AD-A024986 ..... N77-12919 #
AD-A024988 ..... N77-12228 #
AD-A024990 ..... N77-12283 #
AD-A025002 ..... N77-12170 #
AD-A025003 ..... N77-12881 #
AD-A025004 ..... N77-12400 #
AD-A025005 ..... N77-12399 #
AD-A025009 ..... N77-12401 #
AD-A025010 ..... N77-12421 #
AD-A025012 ..... N77-12467 #
AD-A025013 ..... N77-12288 #
AD-A025018 ..... N77-12229 #
AD-A025028 ..... N77-12304 #
AD-A025029 ..... N77-12305 #
AD-A025088 ..... N77-12385 #
AD-A025093 ..... N77-12103 #
AD-A025099 ..... N77-12805 #
AD-A025104 ..... N77-12308 #
AD-A025105 ..... N77-12264 #
AD-A025106 ..... N77-12446 #
AD-A025107 ..... N77-12862 #
AD-A025109 ..... N77-12915 #
AD-A025111 ..... N77-12623 #
AD-A025112 ..... N77-12648 #
AD-A025114 ..... N77-12044 #

AD-A025115 ..... N77-12772 #
AD-A025119 ..... N77-12535 #
AD-A025121 ..... N77-12426 #
AD-A025122 ..... N77-12234 #
AD-A025128 ..... N77-12903 #
AD-A025129 ..... N77-12011 #
AD-A025132 ..... N77-12757 #
AD-A025134 ..... N77-12707 #
AD-A025135 ..... N77-12324 #
AD-A025141 ..... N77-12913 #
AD-A025142 ..... N77-12420 #
AD-A025144 ..... N77-12325 #
AD-A025155 ..... N77-12107 #
AD-A025156 ..... N77-12603 #
AD-A025164 ..... N77-12212 #
AD-A025165 ..... N77-12210 #
AD-A025174 ..... N77-12912 #
AD-A025176 ..... N77-12323 #
AD-A025180 ..... N77-12211 #
AD-A025181 ..... N77-12811 #
AD-A025184 ..... N77-12321 #
AD-A025185 ..... N77-12765 #
AD-A025186 ..... N77-12012 #
AD-A025189 ..... N77-12255 #
AD-A025190 ..... N77-12870 #
AD-A025192 ..... N77-12878 #
AD-A025196 ..... N77-12207 #
AD-A025197 ..... N77-12130 #
AD-A025198 ..... N77-12106 #
AD-A025200 ..... N77-12810 #
AD-A025201 ..... N77-12285 #
AD-A025208 ..... N77-12302 #
AD-A025216 ..... N77-12696 #
AD-A025222 ..... N77-12257 #
AD-A025223 ..... N77-12258 #
AD-A025227 ..... N77-12620*#
AD-A025232 ..... N77-12104 #
AD-A025239 ..... N77-12622 #
AD-A025240 ..... N77-12697 #
AD-A025241 ..... N77-12802 #
AD-A025242 ..... N77-12803 #
AD-A025243 ..... N77-12259 #
AD-A025247 ..... N77-12569 #
AD-A025260 ..... N77-12192 #
AD-A025274 ..... N77-12618 #
AD-A025276 ..... N77-12929 #
AD-A025285 ..... N77-12162 #
AD-A025287 ..... N77-12770 #
AD-A025288 ..... N77-12796 #
AD-A025291 ..... N77-12372 #
AD-A025293 ..... N77-12253 #
AD-A025299 ..... N77-12190 #
AD-A025302 ..... N77-12800 #
AD-A025304 ..... N77-12256 #
AD-A025306 ..... N77-12124 #
AD-A025307 ..... N77-12191 #
AD-A025312 ..... N77-12221 #
AD-A025314 ..... N77-12801 #
AD-A025320 ..... N77-12621 #
AD-A025321 ..... N77-12061 #
AD-A025322 ..... N77-12008 #
AD-A025323 ..... N77-12897 #
AD-A025326 ..... N77-12529 #
AD-A025329 ..... N77-12617 #
AD-A025330 ..... N77-12896 #
AD-A025334 ..... N77-12188 #
AD-A025343 ..... N77-12727 #
AD-A025430 ..... N77-12449 #
AD-A025431 ..... N77-12700 #
AD-A025433 ..... N77-12275 #
AD-A025436 ..... N77-12755 #
AD-A025437 ..... N77-12038 #
AD-A025438 ..... N77-12650 #
AD-A025439 ..... N77-12348 #
AD-A025440 ..... N77-12918 #
AD-A025441 ..... N77-12917 #
AD-A025442 ..... N77-12444 #
AD-A025445 ..... N77-12906 #
AD-A025446 ..... N77-12694 #
AD-A025447 ..... N77-12920 #
AD-A025449 ..... N77-12916 #
AD-A025450 ..... N77-12317 #
AD-A025451 ..... N77-12448 #
AD-A025452 ..... N77-12824 #
AD-A025453 ..... N77-12869 #
AD-A025455 ..... N77-12704 #
AD-A025456 ..... N77-12656 #
AD-A025457 ..... N77-12274 #
AD-A025464 ..... N77-12905 #
AD-A025469 ..... N77-12196 #
AD-A025471 ..... N77-12374 #
AD-A025473 ..... N77-12195 #
AD-A025475 ..... N77-12663 #
AD-A025476 ..... N77-12043 #
AD-A025477 ..... N77-12732 #
AD-A025478 ..... N77-12865 #
AD-A025479 ..... N77-12197 #
AD-A025482 ..... N77-12908 #
AD-A025483 ..... N77-12845 #
AD-A025484 ..... N77-12907 #
AD-A025485 ..... N77-12117 #
AD-A025486 ..... N77-12649 #
AD-A025487 ..... N77-12411 #
AD-A025488 ..... N77-12902 #
AD-A025489 ..... N77-12901 #
AD-A025504 ..... N77-12447 #
AD-A025507 ..... N77-12303 #
AD-A025508 ..... N77-12254 #
AD-A025596 ..... N77-12136 #
AD-A025598 ..... N77-12619 #
AD-A025599 ..... N77-12748 #
AD-A025600 ..... N77-12828 #
AD-A025602 ..... N77-12799 #
AD-A025603 ..... N77-12798 #
AD-A025604 ..... N77-12746 #
AD-A025606 ..... N77-12797 #
AD-A025608 ..... N77-12725 #
AD-A025609 ..... N77-12895 #
AD-A025610 ..... N77-12747 #
AD-A025611 ..... N77-12726 #
AD-A025612 ..... N77-12116 #
AD-A025614 ..... N77-12007 #
AD-A025615 ..... N77-12442 #
AD-A025618 ..... N77-12386 #
AD-A025619 ..... N77-12252 #
AD-A025620 ..... N77-12834 #
AD-A025622 ..... N77-12135 #
AD-A025626 ..... N77-12454 #
AD-A025647 ..... N77-12047 #
AD-A025648 ..... N77-12074 #
AD-A025651 ..... N77-12350 #
AD-A025652 ..... N77-12062 #
AD-A025658 ..... N77-12398 #
AD-A025659 ..... N77-12397 #
AD-A025660 ..... N77-12867 #
AD-A025661 ..... N77-12164 #
AD-A025667 ..... N77-12279 #
AD-A025668 ..... N77-12280 #
AD-A025669 ..... N77-12395 #
AD-A025672 ..... N77-12009 #
AD-A025673 ..... N77-12394 #
AD-A025674 ..... N77-12277 #
AD-A025675 ..... N77-12349 #
AD-A025676 ..... N77-12453 #
AD-A025677 ..... N77-12452 #
AD-A025680 ..... N77-12701 #
AD-A025681 ..... N77-12733 #
AD-A025682 ..... N77-12734 #
AD-A025683 ..... N77-12278 #
AD-A025684 ..... N77-12232 #
AD-A025689 ..... N77-12315 #
AD-A025690 ..... N77-12498 #
AD-A025691 ..... N77-12316 #
AD-A025692 ..... N77-12076 #
AD-A025693 ..... N77-12655 #
AD-A025694 ..... N77-12462 #
AD-A025696 ..... N77-12809 #
AD-A025698 ..... N77-12823 #
AD-A025699 ..... N77-12808 #
AD-A025700 ..... N77-12821 #
AD-A025701 ..... N77-12820 #
AD-A025702 ..... N77-12778 #
AD-A025710 ..... N77-12396 #
AD-A025734 ..... N77-12199 #
AD-A025735 ..... N77-12412 #
AD-A025736 ..... N77-12200 #
AD-A025738 ..... N77-12752 #
AD-A025743 ..... N77-12036 #
AD-A025744 ..... N77-12926 #
AD-A025746 ..... N77-12194 #
AD-A025748 ..... N77-12572 #
AD-A025749 ..... N77-12573 #
AD-A025750 ..... N77-12699 #
AD-A025751 ..... N77-12731 #
AD-A025756 ..... N77-12687 #
AD-A025757 ..... N77-12863 #
AD-A025758 ..... N77-12392 #
AD-A025759 ..... N77-12624 #

AD-A025762 ..... N77-12625 #
AD-A025763 ..... N77-12489 #
AD-A025766 ..... N77-12806 #
AD-A025767 ..... N77-12835 #
AD-A025768 ..... N77-12391 #
AD-A025769 ..... N77-12390 #
AD-A025770 ..... N77-12163 #
AD-A025772 ..... N77-12864 #
AD-A025774 ..... N77-12344 #
AD-A025775 ..... N77-12777 #
AD-A025776 ..... N77-12900 #
AD-A025777 ..... N77-12627 #
AD-A025778 ..... N77-12860 #
AD-A025784 ..... N77-12703 #
AD-A025785 ..... N77-12702 #
AD-A025790 ..... N77-12050 #
AD-A025791 ..... N77-12807 #
AD-A025792 ..... N77-12051 #
AD-A025794 ..... N77-12233 #
AD-A025795 ..... N77-12049 #
AD-A025797 ..... N77-12139 #
AD-A025798 ..... N77-12868 #
AD-A025801 ..... N77-12048 #
AD-A025802 ..... N77-12460 #
AD-A025803 ..... N77-12822 #
AD-A025807 ..... N77-12208 #
AD-A025808 ..... N77-12461 #
AD-A025809 ..... N77-12418 #
AD-A025813 ..... N77-12664 #
AD-A025814 ..... N77-12994 #
AD-A025815 ..... N77-12314 #
AD-A025818 ..... N77-12281 #
AD-A025819 ..... N77-12779 #
AD-A025858 ..... N77-12189 #
AD-A025860 ..... N77-12073 #
AD-A025886 ..... N77-12341 #
AD-A025892 ..... N77-12193 #
AD-A025895 ..... N77-12749 #
AD-A025897 ..... N77-12222 #
AD-A025898 ..... N77-12728 #
AD-A025899 ..... N77-12373 #
AD-A025900 ..... N77-12698 #
AD-A025901 ..... N77-12137 #
AD-A025902 ..... N77-12105 #
AD-A025903 ..... N77-12263 #
AD-A025905 ..... N77-12861 #
AD-A025906 ..... N77-12445 #
AD-A025909 ..... N77-12342 #
AD-A025910 ..... N77-12425 #
AD-A025911 ..... N77-12686 #
AD-A025913 ..... N77-12387 #
AD-A025914 ..... N77-12771 #
AD-A025915 ..... N77-12306 #
AD-A025917 ..... N77-12570 #
AD-A025919 ..... N77-12307 #
AD-A025920 ..... N77-12223 #
AD-A025921 ..... N77-12347 #
AD-A025922 ..... N77-12539 #
AD-A025923 ..... N77-12541 #
AD-A025926 ..... N77-12037 #
AD-A025927 ..... N77-12753 #
AD-A025930 ..... N77-12046 #
AD-A025931 ..... N77-12126 #
AD-A025932 ..... N77-12125 #
AD-A025934 ..... N77-12045 #
AD-A025936 ..... N77-12273 #
AD-A025939 ..... N77-12272 #
AD-A025940 ..... N77-12101 #
AD-A025945 ..... N77-12705 #
AD-A025949 ..... N77-12879 #
AD-A025951 ..... N77-12169 #
AD-A025952 ..... N77-12692 #
AD-A025953 ..... N77-12874 #
AD-A025956 ..... N77-12766 #
AD-A025959 ..... N77-12028 #
AD-A025964 ..... N77-12487 #
AD-A025965 ..... N77-12691 #
AD-A025966 ..... N77-12419 #
AD-A025968 ..... N77-12209 #
AD-A025969 ..... N77-12690 #
AD-A025974 ..... N77-12235 #
AD-A025977 ..... N77-12503 #
AD-A025978 ..... N77-12556 #
AD-A025979 ..... N77-12060 #
AD-A025980 ..... N77-12873 #
AD-A025981 ..... N77-12602 #
AD-A025982 ..... N77-12064*#
AD-A025984 ..... N77-12872 #
AD-A025985 ..... N77-12631 #

AD-A031088 ..... N77-12337 #
AD-A035085 ..... N77-12564 #

ADL-C-79119 ..... N77-12942 #

ADL-760012 ..... N77-12555 #

AEDC-TR-76-29 ..... N77-12237 #
AEDC-TR-76-39 ..... N77-12076 #
AEDC-TR-76-85 ..... N77-12916 #

AELSC-TR-23-1 ..... N77-12259 #

AFAL-TR-75-14 ..... N77-12392 #
AFAL-TR-75-165 ..... N77-12317 #
AFAL-TR-75-194 ..... N77-12390 #
AFAL-TR-75-209 ..... N77-12772 #
AFAL-TR-75-210-VOL-1 ..... N77-12033 #
AFAL-TR-76-19 ..... N77-12374 #

AFAPL-TR-75-57 ..... N77-12061 #
AFAPL-TR-75-98 ..... N77-12539 #
AFAPL-TR-75-110 ..... N77-12347 #
AFAPL-TR-76-13 ..... N77-12541 #
AFAPL-TR-76-14 ..... N77-12446 #
AFAPL-TR-76-21 ..... N77-12879 #
AFAPL-TR-76-28 ..... N77-12412 #

AFCEC-TR-75-15 ..... N77-12603 #
AFCEC-TR-75-20 ..... N77-12077 #

AFCRL-APSG-322 ..... N77-12648 #

AFCRL-ERP-542 ..... N77-12623 #

AFCRL-TR-75-0472 ..... N77-12648 #
AFCRL-TR-75-0551 ..... N77-12258 #
AFCRL-TR-75-0615 ..... N77-12623 #
AFCRL-TR-75-0634 ..... N77-12880 #
AFCRL-TR-76-0032 ..... N77-12618 #
AFCRL-TR-76-0037 ..... N77-12630 #
AFCRL-TR-76-0053 ..... N77-12257 #

AFFDL-TR-75-76-VOL-2 ..... N77-12008 #
AFFDL-TR-75-134 ..... N77-12824 #
AFFDL-TR-75-152 ..... N77-12194 #
AFFDL-TR-75-159-VOL-1 ..... N77-12342 #
AFFDL-TR-75-159-VOL-2 ..... N77-12012 #
AFFDL-TR-76-30 ..... N77-12049 #
AFFDL-TR-76-31 ..... N77-12448 #

AFGL-TR-76-0041 ..... N77-12617 #
AFGL-TR-76-0046 ..... N77-12629 #
AFGL-TR-76-0052 ..... N77-12626 #
AFGL-TR-76-0056 ..... N77-12836 #
AFGL-TR-76-0061 ..... N77-12164 #
AFGL-TR-76-0063 ..... N77-12653 #
AFGL-TR-76-0085 ..... N77-12117 #
AFGL-TR-76-0095 ..... N77-12649 #
AFGL-TR-76-0110 ..... N77-12628 #

AFML-TR-74-136 ..... N77-12135 #
AFML-TR-74-258 ..... N77-12445 #
AFML-TR-75-163 ..... N77-12419 #
AFML-TR-75-178 ..... N77-12228 #
AFML-TR-75-196 ..... N77-12195 #
AFML-TR-75-204 ..... N77-12223 #
AFML-TR-75-211 ..... N77-12197 #
AFML-TR-75-213 ..... N77-12198 #
AFML-TR-75-214 ..... N77-12222 #
AFML-TR-75-215 ..... N77-12210 #
AFML-TR-76-13 ..... N77-12200 #
AFML-TR-76-22 ..... N77-12196 #
AFML-TR-76-23 ..... N77-12191 #
AFML-TR-76-29-PT-1 ..... N77-12188 #
AFML-TR-76-30 ..... N77-12442 #
AFML-TR-76-31 ..... N77-12048 #
AFML-TR-76-33 ..... N77-12209 #
AFML-TR-76-39 ..... N77-12199 #
AFML-TR-76-82 ..... N77-12138 #

AFOSR-76-0437TR ..... N77-12350 #
AFOSR-76-0509TR ..... N77-12647 #
AFOSR-76-0538TR ..... N77-12207 #
AFOSR-76-0539TR ..... N77-12130 #
AFOSR-76-0540TR ..... N77-12106 #
AFOSR-76-0551TR ..... N77-12805 #
AFOSR-76-0553TR ..... N77-12467 #
AFOSR-76-0554TR ..... N77-12903 #

AFOSR-76-0555TR ..... N77-12810 #
AFOSR-76-0557TR ..... N77-12779 #
AFOSR-76-0560TR ..... N77-12811 #
AFOSR-76-0563TR ..... N77-12128 #
AFOSR-76-0565TR ..... N77-12170 #
AFOSR-76-0603TR ..... N77-12735 #

AFRPL-TR-76-30 ..... N77-12460 #

AFRRI-SR76-12 ..... N77-12667 #

AFSWC-TR-76-2 ..... N77-12287 #

AFTAC-TR-76-7 ..... N77-12621 #

AFWL-TR-74-264 ..... N77-12904 #
AFWL-TR-75-138 ..... N77-12047 #
AFWL-TR-75-210 ..... N77-12866 #
AFWL-TR-75-214 ..... N77-12053 #
AFWL-TR-75-219 ..... N77-12078 #
AFWL-TR-75-268 ..... N77-12074 #
AFWL-TR-75-277 ..... N77-12393 #
AFWL-TR-76-6 ..... N77-12687 #

AGARD-AG-222 ..... N77-12352 #

AGARD-CP-191 ..... N77-12708 #
AGARD-CP-195 ..... N77-12013 #
AGARD-CP-210 ..... N77-11969 #

AI-TR-347 ..... N77-12750 #

AIRESEARCH-75-211839 ..... N77-12347 #

AL-11 ..... N77-12270 #

AM-76-2 ..... N77-12915 #

AML-R7602 ..... N77-12370 #

AMMRC-CTR-76-9 ..... N77-12054 #
AMMRC-CTR-76-10 ..... N77-12141 #

AMMRC-MS-76-1 ..... N77-12463 #

AMMRC-TR-76-7 ..... N77-12206 #

AMRL-TR-74-90 ..... N77-12051 #
AMRL-TR-74-95 ..... N77-12705 #
AMRL-TR-74-102 ..... N77-12697 #
AMRL-TR-75-60 ..... N77-12487 #
AMRL-TR-75-62 ..... N77-12691 #
AMRL-TR-75-73 ..... N77-12703 #
AMRL-TR-75-89 ..... N77-12690 #
AMRL-TR-76-10 ..... N77-12686 #
AMRL-TR-76-23 ..... N77-12233 #
AMRL-TR-76-29 ..... N77-12699 #

AMS-1300 ..... N77-12040*#

APG-262 ..... N77-12878 #

APL/JHU-BCO-76-2 ..... N77-12731 #
APL/JHU-SR-76-1A ..... N77-12552 #

AR-1 ..... N77-12193 #
AR-1 ..... N77-12513*#

ARAP-262-VOL-2 ..... N77-12012 #
ARAP-263 ..... N77-12342 #

ARC-CP-1344 ..... N77-12067 #

ARC-36303 ..... N77-12067 #

ARL-4 ..... N77-12632 #

ARO-VKF-TR-75-106 ..... N77-12237 #
ARO-VKF-TR-75-147 ..... N77-12076 #

ARO-8049.15-M ..... N77-12802 #
ARO-8090.17-E ..... N77-12140 #
ARO-8906.17-P ..... N77-12910 #
ARO-8915.20-P ..... N77-12845 #
ARO-10733.7-P ..... N77-12909 #
ARO-11007.3-MC ..... N77-12907 #
ARO-11298.11-P ..... N77-12908 #
ARO-11459.7-P ..... N77-12163 #
ARO-11959.7-M ..... N77-12803 #

ARO-12142.3-EL ..... N77-12748 #
ARO-12640.3-M ..... N77-12770 #
ARO-12640.5-M ..... N77-12796 #
ARO-13456.1-AP ..... N77-12864 #

ATC-B9410016CR-14 ..... N77-12263 #

ATL-TR-229 ..... N77-12106 #

ATR-1 ..... N77-12143 #
ATR-1 ..... N77-12702 #
ATR-2 ..... N77-12190 #

BBN-3315 ..... N77-12766 #

BC-SDAL-76-01 ..... N77-12258 #

BCPD-L2-6 ..... N77-12474*#

BLL-DRIC-TRANS-4307-(3623.66) N77-12830

BLL-RISLEY-TR-2994-(9091.9F) N77-11988
BLL-RISLEY-TR-3038-(9091.9F) N77-12177

BM-OFR-75-76 ..... N77-12499 #
BM-OFR-94-76 ..... N77-12322 #

BM-TPR-95 ..... N77-12565 #

BMFT-FB-T-76-18 ..... N77-12219 #

BRL-CR-299 ..... N77-12192 #

BRL-1874 ..... N77-12912 #
BRL-1882 ..... N77-12625 #

BR51963 ..... N77-12370 #
BR52595 ..... N77-12249 #
BR52816 ..... N77-12371 #

C-500 ..... N77-12515*#

CA-DOT-DS-4155-1-75-9 ..... N77-12458 #

CA-DOT-TL-5167-3-75-37 ..... N77-12443 #

CEPHAG-3/76 ..... N77-12614 #
CEPHAG-23/75 ..... N77-12299 #

CERL-IR-P-66-PT-2 ..... N77-12736 #

CERL-TR-E-90 ..... N77-12543 #

CERL-TR-M-180 ..... N77-12465 #

CGR/DC-18/75 ..... N77-12034 #

CHR-76-7 ..... N77-12542 #

CN-ISSN-0082-5263 ..... N77-12010 #

CNA-PAPER-154 ..... N77-12917 #

CNA-PROFESSIONAL-PAPER-153 ..... N77-12918 #

COMPLETION-72 ..... N77-12582 #

CONF-760408-2 ..... N77-12790 #

CONTRIB-2844 ..... N77-12987*#

COVOS-1 ..... N77-12615 #

CRC-APRAC-CAPA-1-69-3 ..... N77-12167 #

CRIF-IN-3 ..... N77-12776 #

CRREL-76-11 ..... N77-12489 #

CRSR-648 ..... N77-12988*#

CRT-3000-1 ..... N77-12448 #

CTS-75-21 ..... N77-12576 #

C72-731.2/501 ..... N77-12395 #
C72-731/501 ..... N77-12280 #
C74-455/201-VOL-1 ..... N77-12033 #
C75-266/201 ..... N77-12226 #

C76-320.3/501 ..... N77-12516*#

D-222 ..... N77-12611 #
D-230 ..... N77-12612 #
D-236 ..... N77-12956 #
D-240 ..... N77-12085 #

DARCOM-ITC-02-08-76-016 ..... N77-12309 #
DARCOM-ITC-02-08-76-017 ..... N77-12457 #
DARCOM-ITC-02-08-76-023 ..... N77-12379 #
DARCOM-ITC-02-08-76-102 ..... N77-12168 #
DARCOM-ITC-02-08-76-105 ..... N77-12375 #
DARCOM-ITC-02-08-76-114 ..... N77-12413 #
DARCOM-ITC-02-08-76-203 ..... N77-12535 #
DARCOM-ITC-02-08-76-204 ..... N77-12427 #
DARCOM-ITC-02-08-76-208 ..... N77-12426 #
DARCOM-ITC-02-08-76-214 ..... N77-12825 #

DC-TR-1242-17 ..... N77-12287 #

DEL-SG-8-76 ..... N77-12600 #

DGS-225 ..... N77-12626 #

DLR-FB-75-18 ..... N77-12002 #
DLR-FB-75-61 ..... N77-12003 #
DLR-FB-76-21 ..... N77-12004 #
DLR-FB-76-22 ..... N77-12338 #
DLR-FB-76-24 ..... N77-12339 #
DLR-FB-76-25 ..... N77-12616 #
DLR-FB-76-26 ..... N77-12005 #
DLR-FB-76-27 ..... N77-12161 #
DLR-FB-76-28 ..... N77-12056 #
DLR-FB-76-29 ..... N77-12186 #

DLR-MITT-75-19 ..... N77-12914 #

DMS-DR-2283 ..... N77-12111*#
DMS-DR-2309 ..... N77-12108*#
DMS-DR-2318-VOL-1 ..... N77-12109*#
DMS-DR-2318-VOL-2 ..... N77-12110*#

DNA-3778T ..... N77-12286 #
DNA-3788T ..... N77-12624 #
DNA-3821F ..... N77-12440 #

DOD-AGPSRS-76-5 ..... N77-12273 #

DOI/OMPRA/CL-76/01-PT-1 ..... N77-12592 #

DOT-TSC-OST-76-7 ..... N77-12035 #
DOT-TSC-OST-76-25-1-VOL-1 ..... N77-12729 #
DOT-TSC-OST-76-25-2-VOL-2 ..... N77-12730 #

DOT-TST-75-51 ..... N77-12633 #
DOT-TST-76-57 ..... N77-12536 #
DOT-TST-76T-1 ..... N77-12953 #

DRB-DR-225 ..... N77-12671 #

DRSAV-76-16 ..... N77-12054 #
DRSAV-76-17 ..... N77-12139 #

DS/AE/76-1 ..... N77-12398 #

DSPS-76-18 ..... N77-12418 #

DTNSRDC-4397 ..... N77-12778 #

D2:1976 ..... N77-12936 #
D180-19063-1 ..... N77-12869 #
D180-19447-1 ..... N77-12420 #
D210-10965-1 ..... N77-12052 #

E-21-661/A-1751 ..... N77-12283 #
E-8754 ..... N77-12000*#
E-8831 ..... N77-12184*#
E-8833 ..... N77-12099*#
E-8846 ..... N77-12185*#
E-8851 ..... N77-12847*#
E-8885 ..... N77-12517*#
E-8894 ..... N77-12518*#
E-8936 ..... N77-12121*#
E-8944 ..... N77-12236*#
E-8946 ..... N77-11991*#
E-8956 ..... N77-12519*#
E-8973 ..... N77-12423*#
E-8975 ..... N77-12406*#
E-8983 ..... N77-12520*#
E-8985 ..... N77-12521*#
E-9006 ..... N77-12522*#
E-9007 ..... N77-12523*#
E-9021 ..... N77-12297*#

ECN-15 ..... N77-12366 #
ECN-19 ..... N77-12295 #

ECOM-72-0229F ..... N77-12303 #
ECOM-74-0568-1 ..... N77-12306 #
ECOM-75-0140-F ..... N77-12263 #
ECOM-75-1305-2 ..... N77-12301 #
ECOM-75-1368-2 ..... N77-12308 #
ECOM-76-0332-1 ..... N77-12259 #
ECOM-4397 ..... N77-12313 #
ECOM-5583 ..... N77-12386 #
ECOM-5591 ..... N77-12865 #
ECOM-5592 ..... N77-12655 #

ECR-59 ..... N77-12424 #
ECR-62 ..... N77-12293 #
ECR-63 ..... N77-12294 #
ECR-64 ..... N77-12296 #

ED-CR-76048 ..... N77-12570 #

EDD-W-06596-2 ..... N77-12308 #

EHL-M-76M-2 ..... N77-12571 #

EIMAC-TR-76-1 ..... N77-12316 #

EM-CR-76026 ..... N77-12466 #
EM-CR-76042 ..... N77-12447 #

EPA-208-MVRPC-M6 ..... N77-12937 #
EPA-330/3-75-001 ..... N77-12486*#
EPA-340/1-76-004 ..... N77-12588 #
EPA-450/2-76-008 ..... N77-12578 #
EPA-450/3-76-012-C-VOL-3 ..... N77-12583 #
EPA-560/4-76-004 ..... N77-12591 #
EPA-600/2-76-127 ..... N77-12581 #
EPA-600/2-76-136-A-VOL-1 ..... N77-12597 #
EPA-600/2-76-140 ..... N77-12595 #
EPA-600/2-76-154-A ..... N77-12601 #
EPA-600/2-76-167 ..... N77-12501 #
EPA-600/2-76-177-A-VOL-1 ..... N77-12231 #
EPA-600/2-76-178 ..... N77-12537 #
EPA-600/2-76-179 ..... N77-12948 #
EPA-600/3-76-040 ..... N77-12566 #
EPA-600/3-76-070 ..... N77-12575 #
EPA-600/3-76-073 ..... N77-12599 #
EPA-600/4-76-008 ..... N77-12562 #
EPA-600/5-76-004 ..... N77-12574 #
EPA-600/7-76-004-A ..... N77-12533 #
EPA-600/7-76-004-B ..... N77-12534 #
EPA-600/9-76-005 ..... N77-12567 #
EPA-908/3-76-001 ..... N77-12577 #

EPRI-TD-172 ..... N77-12318 #

EPRI-1235-2A ..... N77-12598 #

EPRI/EC-137 ..... N77-12589 #
EPRI/ER-188 ..... N77-12551 #
EPRI/FP-165 ..... N77-12568 #

ERDA/JPL-954328-76/4 ..... N77-12524*#
ERDA/JPL-954334-76/3 ..... N77-12514*#
ERDA/JPL-954344-76/3 ..... N77-12512*#
ERDA/JPL-954355-76/11 ..... N77-12515*#
ERDA/JPL-954356-76/2 ..... N77-12513*#
ERDA/JPL-954372-76/3 ..... N77-12516*#
ERDA/NASA-31293-76/3 ..... N77-12507*#

ERIM-110100-14-F ..... N77-12317 #

ESA-CR(P)-837-APP ..... N77-12091 #
ESA-CR(P)-837-VOL-1 ..... N77-12087 #
ESA-CR(P)-837-VOL-2 ..... N77-12088 #
ESA-CR(P)-837-VOL-3 ..... N77-12089 #
ESA-CR(P)-837-VOL-4 ..... N77-12090 #
ESA-CR(P)-840 ..... N77-12093 #
ESA-CR(P)-842-PT-1/2 ..... N77-12769 #
ESA-CR(P)-846 ..... N77-12409 #
ESA-CR(P)-850 ..... N77-12250 #
ESA-CR(P)-851 ..... N77-12251 #

ESA-ESTL-20 ..... N77-12409 #

ESA-TT-300 ..... N77-12914 #
ESA-TT-328 ..... N77-12159 #
ESA-TT-331 ..... N77-12160 #
ESA-TT-332 ..... N77-12002 #
ESA-TT-333 ..... N77-12003 #
ESA-TT-334 ..... N77-12004 #
ESA-TT-335 ..... N77-12005 #
ESA-TT-336 ..... N77-12186 #
ESA-TT-337 ..... N77-12615 #
ESA-TT-348 ..... N77-12338 #
ESA-TT-349 ..... N77-12161 #
ESA-TT-350 ..... N77-12056 #
ESA-TT-353 ..... N77-12187 #
ESA-TT-354 ..... N77-12339 #
ESA-TT-355 ..... N77-12616 #

ESD-TR-75-313 ..... N77-12901 #
ESD-TR-75-335 ..... N77-12627 #
ESD-TR-76-74 ..... N77-12302 #

ESL-IR-651 ..... N77-12779 #

ESS/SS-699-APP ..... N77-12091 #
ESS/SS-699-VOL-1 ..... N77-12087 #
ESS/SS-699-VOL-2 ..... N77-12088 #
ESS/SS-699-VOL-3 ..... N77-12089 #
ESS/SS-699-VOL-4 ..... N77-12090 #

ETL-0055 ..... N77-12101 #

E77-10042 ..... N77-12472*#
E77-10043 ..... N77-12473*#
E77-10044 ..... N77-12474*#
E77-10045 ..... N77-12475*#

FA-TR-75070 ..... N77-12385 #
FA-TR-75073 ..... N77-12212 #
FA-TR-75075 ..... N77-12388 #

FA-TT-75082 ..... N77-12234 #

FCM-76-1 ..... N77-12657 #
FCM-76-2 ..... N77-12658 #

FEA/B-76/028 ..... N77-12930 #
FEA/B-76/307 ..... N77-12540 #
FEA/B-76/702 ..... N77-12527 #
FEA/D-76/338 ..... N77-12587 #
FEA/D-76/340 ..... N77-12545 #
FEA/D-76/343 ..... N77-12544 #
FEA/G-76/193 ..... N77-12549 #
FEA/G-76/350 ..... N77-12530 #
FEA/G-76/358 ..... N77-12531 #
FEA/G-76/359 ..... N77-12532 #
FEA/S-76/310 ..... N77-12500 #

FHWA-KS-RD-73-3 ..... N77-12459 #

FHWA-LA-RR-100 ..... N77-12441 #

FHWA-RD-76-S0505 ..... N77-12458 #
FHWA-RD-76-94 ..... N77-12706 #

FIBL-F-C4270-01 ..... N77-12075 #

GAE/AE/76M-2 ..... N77-12062 #

GEP/PH/75D-17 ..... N77-12397 #

GS/EX/8/1/75/C ..... N77-12414 #
GS/PROD/832/1/76/C ..... N77-12415 #
GS/TECH/MISC/117/75/C ..... N77-12205 #
GS/TECH/558/2/76/C ..... N77-12204 #
GS/TECH/674/1/75/C ..... N77-12165 #

GSFC/LN-76/007 ..... N77-12492*#
GSFC/LN-76/008 ..... N77-12493*#
GSFC/LN-76/013 ..... N77-12469*+
GSFC/LU-76/007 ..... N77-12490*#
GSFC/LU-76/008 ..... N77-12491*#
GSFC/LU-76/013 ..... N77-12468*+

HAC-P76-77 ..... N77-12863 #

HAC-REF-D4878 ..... N77-12863 #

HAES-41 ..... N77-12629 #

HDL-CR-75-059-1 ..... N77-12341 #

HDL-TM-75-33 ..... N77-12728 #

HDL-TR-1699 ..... N77-12285 #
HDL-TR-1731 ..... N77-12311 #
HDL-TR-1736 ..... N77-12324 #
HDL-TR-1737 ..... N77-12276 #

HR1084 ..... N77-12251 #

IBM-76W-0026 ..... N77-12772 #

IDA/HQ-75-17527 ..... N77-12931 #

IEA-75-3 ..... N77-12527 #

IFKM-76/1 ..... N77-12439 #

IFS-76007 ..... N77-12378 #

IIEQ-76-04 ..... N77-12590 #

IPR-1 ..... N77-12529 #

IR-1 ..... N77-12306 #
IR-1 ..... N77-12550 #
IR-2 ..... N77-12083*#

ISAS-540 ..... N77-12434 #
ISAS-541 ..... N77-12330 #

ISBN-0-309-02507-9 ..... N77-12377 #
ISBN-0-85494-395-1 ..... N77-12405 #
ISBN-0-85494-396-X ..... N77-12681 #
ISBN-0-902553-13-5 ..... N77-12957 #
ISBN-3-88148-145-1 ..... N77-12641 #
ISBN-91-540-2540-0 ..... N77-12936 #
ISBN-91-540-2557-5 ..... N77-12949 #
ISBN-92-63-10431-X ..... N77-12559 #
ISBN-92-63-10441-7 ..... N77-12640 #
ISBN-92-835-0177-2 ..... N77-12708 #
ISBN-92-835-0178-0 ..... N77-11969 #
ISBN-92-835-0179-9 ..... N77-12013 #
ISBN-92-835-1228-6 ..... N77-12352 #

ISI/TM-76-3 ..... N77-12752 #

ISL-R-123/75 ..... N77-12833 #

ISS-L-75/14 ..... N77-12560 #

ISS-P-75/3 ..... N77-12072 #
ISS-P-75/13 ..... N77-12683 #
ISS-P-75/17 ..... N77-12685 #

ISS-R-75/12 ..... N77-12682 #
ISS-R-75/16 ..... N77-12684 #

ISS-T-75/2 ..... N77-12724 #
ISS-T-75/11 ..... N77-12991 #

ISVR-TR-85 ..... N77-12369 #
ISVR-TR-86 ..... N77-12437 #

ISWRRI-74 ..... N77-12563 #

ITR-2 ..... N77-12301 #

JPL-SP-43-33 ..... N77-12483*#

JPL-TM-33-697-REV-1 ..... N77-12292*#
JPL-TM-33-798 ..... N77-12115*#
JPL-TM-33-800 ..... N77-12244*#
JPL-TM-33-802 ..... N77-12509*#
JPL-TM-33-807 ..... N77-12788*#

JPL-660-22 ..... N77-12097*#
JPL-5030-24 ..... N77-12550 #
JPL-5040-31 ..... N77-12220*#

JPRS-68285 ..... N77-12422 #
JPRS-68310 ..... N77-12693 #

JSC-S-460 ..... N77-12767*#

JSC-10140 ..... N77-12364*#
JSC-10936 ..... N77-12092*#

JSC-10949 ..... N77-12767*#
JSC-11663 ..... N77-12481*#

KNMI-97-126 ..... N77-12645 #
KNMI-150-9 ..... N77-12646 #
KNMI-151-6 ..... N77-12643 #
KNMI-151-7 ..... N77-12644 #

KRI-9212-III-VOL-3 ..... N77-12927 #

KTH-AERO-FI-47 ..... N77-12331 #

L-10487 ..... N77-11992*#
L-10502 ..... N77-12610*#
L-10527 ..... N77-12218*#
L-10686 ..... N77-12032*#
L-10751 ..... N77-12436*#
L-10841 ..... N77-12066*#
L-10844 ..... N77-11999*#
L-10887 ..... N77-11995*#
L-10914 ..... N77-12435*#
L-10950 ..... N77-12071*#
L-10994 ..... N77-11997*#
L-11003 ..... N77-11994*#
L-11063 ..... N77-11998*#
L-11103 ..... N77-11968*#
L-59333-2 ..... N77-12757 #

LA-74-1B(B)-FORR-100 ..... N77-12441 #

LACIE-00418 ..... N77-12481*#

LMSC-D406484 ..... N77-12167 #
LMSC-D502668 ..... N77-12391 #

LRBA-E-602-NT-42/SIE ..... N77-12407 #
LRBA-E-602-NT-49/SIE ..... N77-12408 #
LRBA-E-815-PV-4/SAE ..... N77-12001 #

L10854 ..... N77-12027*#
L10979 ..... N77-12065*#

M-179 ..... N77-12639*#
M-182 ..... N77-11996*#
M-190 ..... N77-12954*#
M-194 ..... N77-12992*#

MA/RD-940-T76065 ..... N77-12552 #

MANCP-336(76) ..... N77-12103 #

MCR-76-465 ..... N77-12113*#
MCR-76-559 ..... N77-12368*#

MDC-10158-01 ..... N77-12393 #

MIMEO-SER-1064 ..... N77-12803 #

MLI-76/1 ..... N77-12943 #

MOU-IS-PR-9 ..... N77-12732 #

MPAE-W-100-76-01 ..... N77-12613 #

MPIS-MITT-61 ..... N77-12832 #

MQAD-R-234 ..... N77-12371 #

MRC-N-214 ..... N77-12624 #

MSC/TPR/601/1025-PT-2 ..... N77-12133*#

MTI-76TR14 ..... N77-12412 #

MTR-7254 ..... N77-12945 #

MVMA-UNC-74-16 ..... N77-12950 #

N1.76-1 ..... N77-12230*#

NADC-75359-30 ..... N77-12417 #
NADC-76147-30 ..... N77-12137 #

NAPI-TR-2072-VOL-1 ..... N77-12861 #

NAMRL-1223 ..... N77-12704 #

NARC-76/1 ..... N77-12561 #

NASA-CASE-ARC-10990-1 ..... N77-12031*#
NASA-CASE-ARC-10991-1 ..... N77-12157*#

NASA-CASE-GSC-12150-1 ..... N77-12247*#

NASA-CASE-LAR-11626-1 ..... N77-12332*#

NASA-CASE-MFS-23062-1 ..... N77-12402*
NASA-CASE-MFS-23270-1 ..... N77-12511*#
NASA-CASE-MFS-23460-1 ..... N77-12070*#

NASA-CASE-MSC-12506-1 ..... N77-12239*
NASA-CASE-MSC-16170-1 ..... N77-12248*#

NASA-CASE-NPO-13428-1 ..... N77-12721*
NASA-CASE-NPO-13447-1 ..... N77-12721*
NASA-CASE-NPO-13543-1 ..... N77-12240*
NASA-CASE-NPO-13545-1 ..... N77-12240*

NASA-CR-2749 ..... N77-12639*#
NASA-CR-2750 ..... N77-11996*#
NASA-CR-2766 ..... N77-12041*#
NASA-CR-2768 ..... N77-12954*#
NASA-CR-135069 ..... N77-12182*#
NASA-CR-135082 ..... N77-12403*#
NASA-CR-135097 ..... N77-12181*#
NASA-CR-135098 ..... N77-12510*#
NASA-CR-135112 ..... N77-12230*#
NASA-CR-137922 ..... N77-12055*#
NASA-CR-144818 ..... N77-12361*#
NASA-CR-145039 ..... N77-12133*#
NASA-CR-145068 ..... N77-12039*#
NASA-CR-145106 ..... N77-12367*#
NASA-CR-146531 ..... N77-12058*#
NASA-CR-147138 ..... N77-12064*#
NASA-CR-147644 ..... N77-12108*#
NASA-CR-147646 ..... N77-12109*#
NASA-CR-147647 ..... N77-12110*#
NASA-CR-147649 ..... N77-12111*#
NASA-CR-149027 ..... N77-12637*#
NASA-CR-149147 ..... N77-12115*#
NASA-CR-149160 ..... N77-12606*#
NASA-CR-149161 ..... N77-12935*#
NASA-CR-149162 ..... N77-12989*#
NASA-CR-149163 ..... N77-12470*+
NASA-CR-149165 ..... N77-12483*#
NASA-CR-149166 ..... N77-12333*#
NASA-CR-149167 ..... N77-12158*#
NASA-CR-149168 ..... N77-12636*#
NASA-CR-149169 ..... N77-12635*#
NASA-CR-149171 ..... N77-12472*#
NASA-CR-149172 ..... N77-12473*#
NASA-CR-149180 ..... N77-12474*#
NASA-CR-149181 ..... N77-12475*#
NASA-CR-149206 ..... N77-12220*#
NASA-CR-149207 ..... N77-12844*#
NASA-CR-149208 ..... N77-12486*#
NASA-CR-149209 ..... N77-12620*#
NASA-CR-149210 ..... N77-12634*#
NASA-CR-149214 ..... N77-12988*#
NASA-CR-149215 ..... N77-12524*#
NASA-CR-149226 ..... N77-12029*#
NASA-CR-149227 ..... N77-12030*#
NASA-CR-149228 ..... N77-12476*#
NASA-CR-149229 ..... N77-12477*#
NASA-CR-149230 ..... N77-12478*#
NASA-CR-149232 ..... N77-12788*#
NASA-CR-149233 ..... N77-12516*#
NASA-CR-149234 ..... N77-12123*#
NASA-CR-149235 ..... N77-12509*#
NASA-CR-149237 ..... N77-12512*#
NASA-CR-149238 ..... N77-12514*#
NASA-CR-149239 ..... N77-12244*#
NASA-CR-149241 ..... N77-12292*#
NASA-CR-149242 ..... N77-12513*#
NASA-CR-149244 ..... N77-12097*#
NASA-CR-149245 ..... N77-12987*#
NASA-CR-150064 ..... N77-12507*#
NASA-CR-150066 ..... N77-12638*#
NASA-CR-150067 ..... N77-12083*#
NASA-CR-150068 ..... N77-12084*#
NASA-CR-150106 ..... N77-12183*#
NASA-CR-150107 ..... N77-12859*#
NASA-CR-150109 ..... N77-12368*#
NASA-CR-150116 ..... N77-12113*#
NASA-CR-151106 ..... N77-12680*#
NASA-CR-151107 ..... N77-12243*#
NASA-CR-151108 ..... N77-12120*#

NASA-CR-151109 ..... N77-12068*#
NASA-CR-151110 ..... N77-12364*#
NASA-CR-151112 ..... N77-12365*#
NASA-CR-151113 ..... N77-12112*#
NASA-CR-151924 ..... N77-12040*#

NASA-SP-345 ..... N77-12959*#
NASA-SP-414 ..... N77-12718*#
NASA-SP-7011(159) ..... N77-12670*+
NASA-SP-7037(74) ..... N77-11967*+
NASA-SP-7043(10) ..... N77-12505*+

NASA-TM-X-3412 ..... N77-12027*#
NASA-TM-X-3440 ..... N77-12990*#
NASA-TM-X-3449 ..... N77-12992*#
NASA-TM-X-3452 ..... N77-12000*#
NASA-TM-X-3456 ..... N77-12099*#
NASA-TM-X-58186 ..... N77-12092*#
NASA-TM-X-64868 ..... N77-12114*#
NASA-TM-X-71225 ..... N77-12857*#
NASA-TM-X-73180 ..... N77-12069*#
NASA-TM-X-73350 ..... N77-12329*#
NASA-TM-X-73465 ..... N77-12184*#
NASA-TM-X-73489 ..... N77-12517*#
NASA-TM-X-73496 ..... N77-12518*#
NASA-TM-X-73511 ..... N77-12847*#
NASA-TM-X-73518 ..... N77-12059*#
NASA-TM-X-73522 ..... N77-12121*#
NASA-TM-X-73527 ..... N77-12236*#
NASA-TM-X-73531 ..... N77-12519*#
NASA-TM-X-73541 ..... N77-12423*#
NASA-TM-X-73543 ..... N77-12406*#
NASA-TM-X-73547 ..... N77-12520*#
NASA-TM-X-73549 ..... N77-12521*#
NASA-TM-X-73559 ..... N77-11991*#
NASA-TM-X-73562 ..... N77-12522*#
NASA-TM-X-73563 ..... N77-12523*#
NASA-TM-X-73572 ..... N77-12297*#
NASA-TM-X-73900 ..... N77-12363*#
NASA-TM-X-73978 ..... N77-12119*#
NASA-TM-X-73983 ..... N77-12609*#
NASA-TM-X-73984 ..... N77-11989*#
NASA-TM-X-73988 ..... N77-12134*#
NASA-TM-X-74225 ..... N77-12480*#
NASA-TM-X-74226 ..... N77-12481*#
NASA-TM-X-74227 ..... N77-12335*#
NASA-TM-X-74258 ..... N77-12493*#
NASA-TM-X-74259 ..... N77-12492*#
NASA-TM-X-74261 ..... N77-12490*#
NASA-TM-X-74262 ..... N77-12491*#
NASA-TM-X-74296 ..... N77-12925*#
NASA-TM-X-74297 ..... N77-12469*+
NASA-TM-X-74298 ..... N77-12468*+

NASA-TN-D-8243 ..... N77-11993*#
NASA-TN-D-8263 ..... N77-12435*#
NASA-TN-D-8265 ..... N77-11992*#
NASA-TN-D-8275 ..... N77-12066*#
NASA-TN-D-8288 ..... N77-12610*#
NASA-TN-D-8289 ..... N77-12218*#
NASA-TN-D-8296 ..... N77-12065*#
NASA-TN-D-8300 ..... N77-12436*#
NASA-TN-D-8304 ..... N77-12071*#
NASA-TN-D-8309 ..... N77-11995*#
NASA-TN-D-8323 ..... N77-11999*#
NASA-TN-D-8334 ..... N77-11994*#
NASA-TN-D-8335 ..... N77-11998*#
NASA-TN-D-8336 ..... N77-12032*#
NASA-TN-D-8350 ..... N77-11997*#
NASA-TN-D-8354 ..... N77-12185*#
NASA-TN-D-8360 ..... N77-11968*#

NASA-TR-R-467 ..... N77-12767*#

NASA-TT-F-664 ..... N77-12993*#
NASA-TT-F-16732 ..... N77-12479*#
NASA-TT-F-16738 ..... N77-12094*#
NASA-TT-F-16739 ..... N77-12095*#
NASA-TT-F-16743 ..... N77-12841*#
NASA-TT-F-16748 ..... N77-12122*#
NASA-TT-F-16749 ..... N77-12081*#
NASA-TT-F-16760 ..... N77-12096*#
NASA-TT-F-16761 ..... N77-12508*#
NASA-TT-F-16763 ..... N77-12180*#
NASA-TT-F-16764 ..... N77-12955*#
NASA-TT-F-17073 ..... N77-12057*#
NASA-TT-F-17096 ..... N77-12080*#
NASA-TT-F-17100 ..... N77-12118*#
NASA-TT-F-17107 ..... N77-12608*#
NASA-TT-F-17114 ..... N77-12082*#
NASA-TT-F-17118 ..... N77-11990*#
NASA-TT-F-17274 ..... N77-12986*#
NASA-TT-F-17504 ..... N77-12482*#

NATC-RW-9R-76 ..... N77-12050 #

NAVAIR-50-1G-522 ..... N77-12652 #

NAVTRAEQUIPC-76-C-0007-1 ..... N77-12075 #

NBS-GCR-76-63 ..... N77-12737 #

NBS-TN-917 ..... N77-12773 #

NBSIR-75-1049 ..... N77-12166 #
NBSIR-76-841 ..... N77-12376 #
NBSIR-76-1069 ..... N77-12224 #
NBSIR-76-1081 ..... N77-12202 #

NCTCOG/WR-76/01 ..... N77-12947 #

NELC-TR-1984 ..... N77-12037 #

NEPRF-TP-2-76 ..... N77-12656 #

NEPRF-TR-13-75(ODSI) ..... N77-12654 #

NIH-Y01-HV-30011-3 ..... N77-12220*#

NLL-M-24095-(5828.4F) N77-12360
NLL-M-24126-(5828.4F) N77-12924
NLL-M-24127-(5828.4F) N77-12923
NLL-M-24128-(5828.4F) N77-12922
NLL-M-25334-(5828.4F) N77-12176
NLL-M-25348-(5828.4F) N77-12173
NLL-M-25349-(5828.4F) N77-12174
NLL-M-25350-(5828.4F) N77-12328
NLL-M-25379-(5828.4F) N77-12175

NOAA-S/T-76-2045 ..... N77-12378 #
NOAA-S/T-76-2782 ..... N77-12658 #

NOAA-TR-ERL-345 ..... N77-12759 #
NOAA-TR-ERL-358 ..... N77-12270 #
NOAA-TR-ERL-362 ..... N77-12632 #

NOAA-76030301 ..... N77-12759 #
NOAA-76033103 ..... N77-12378 #
NOAA-76051205 ..... N77-12657 #
NOAA-76051302 ..... N77-12270 #
NOAA-76052104 ..... N77-12658 #
NOAA-76052105-VOL-20-NO-3 ..... N77-12659 #
NOAA-76052603 ..... N77-12547 #
NOAA-76052803 ..... N77-12600 #
NOAA-76060103 ..... N77-12632 #

NPS-53FE76051 ..... N77-12804 #

NRL-MR-3265 ..... N77-12751 #
NRL-MR-3277 ..... N77-12284 #
NRL-MR-3285 ..... N77-12881 #
NRL-MR-3289 ..... N77-12461 #
NRL-MR-3294 ..... N77-12232 #

NRL-7687 ..... N77-12278 #
NRL-7990 ..... N77-12319 #

NSF/MRLC-74-02 ..... N77-12225 #
NSF/RA-760127 ..... N77-12410 #
NSF/RA-760128 ..... N77-12550 #
NSF/RA-760129 ..... N77-12553 #
NSF/RA-760162 ..... N77-12502 #
NSF/RA-760182 ..... N77-12546 #
NSF/RA/N-75-309 ..... N77-12548 #
NSF/RANN/SE/AER74-14918-A01/PR ..... N77-12553 #
NSF/RANN/SE/AER75-19576/PR-75 ..... N77-12546 #
NSF/RANN/SE/GI-43090/PR-75-2 ..... N77-12548 #

NSWC/WOL/TR-75-200 ..... N77-12256 #
NSWC/WOL/TR-76-20 ..... N77-12800 #

NTIS/DF-76/003A ..... N77-12761 #

NTISUB/B/138-76/008 ..... N77-12491*#
NTISUB/B/138-76/013 ..... N77-12468*+
NTISUB/B/139-76/013 ..... N77-12469*+

NUREG-0105 ..... N77-12346 #

NUREG-0106 ..... N77-12345 #

NUSC-TD-5389 ..... N77-12834 #

NUSC-TR-4860 ..... N77-12227 #
NUSC-TR-5303 ..... N77-12756 #
NUSC-TR-5353 ..... N77-12806 #

NWC-TP-5693 ..... N77-12124 #
NWC-TP-5820 ..... N77-12564 #

ODSI-694 ..... N77-12654 #

ONERA-NT-176 ..... N77-12159 #
ONERA-NT-1975-13 ..... N77-12160 #

ONERA-P-1976-1 ..... N77-12615 #
ONERA-P-1976-2 ..... N77-12187 #

ONR-CR213-120-2 ..... N77-12871 #

ONRL-C-11-76 ..... N77-12255 #

ONRL-R-4-76 ..... N77-12906 #

OT-SP-76-10 ..... N77-12269 #

OTR-76-89 ..... N77-12268 #
OTR-76-91 ..... N77-12267 #
OTR-76-92 ..... N77-12266 #

OWRT-A-023-COLO(2) ..... N77-12582 #
OWRT-A-025-UTAH(1) ..... N77-12596 #
OWRT-A-034-NJ(3) ..... N77-12594 #
OWRT-A-048-KY(1) ..... N77-12938 #
OWRT-A-091-MISS(1) ..... N77-12944 #
OWRT-A-096-MISS(1) ..... N77-12593 #

OWRT-B-043-IA(1) ..... N77-12563 #
OWRT-B-044-NU(3) ..... N77-12584 #

OWRT-C-3277(3713)(11) ..... N77-12939 #
OWRT-C-3277(3713)(12) ..... N77-12940 #
OWRT-C-3277(3713)(13) ..... N77-12941 #

P-62 ..... N77-12642 #

PB-250014-03 ..... N77-12659 #
PB-251156/6 ..... N77-12795 #
PB-253432/9 ..... N77-12936 #
PB-254035/9 ..... N77-12443 #
PB-254059/9 ..... N77-12527 #
PB-254377/5 ..... N77-12937 #
PB-254387/4 ..... N77-12562 #
PB-254401/3 ..... N77-12568 #
PB-254447/6 ..... N77-12565 #
PB-254450/0 ..... N77-12566 #
PB-254490/6 ..... N77-12938 #
PB-254614/1 ..... N77-12563 #
PB-254658/8 ..... N77-12567 #
PB-254663/8 ..... N77-12561 #
PB-254911/1 ..... N77-12441 #
PB-255170/3 ..... N77-12526 #
PB-255222/2 ..... N77-12943 #
PB-255277/6 ..... N77-12580 #
PB-255317/0 ..... N77-12597 #
PB-255404/6 ..... N77-12488 #
PB-255454/1 ..... N77-12599 #
PB-255490/5 ..... N77-12459 #
PB-255503/5 ..... N77-12927 #
PB-255545/6 ..... N77-12410 #
PB-255550/6 ..... N77-12598 #
PB-255590/2 ..... N77-12486*#
PB-255606/6 ..... N77-12553 #
PB-255607/4 ..... N77-12502 #
PB-255623/1 ..... N77-12930 #
PB-255624/9 ..... N77-12540 #
PB-255639/7 ..... N77-12552 #
PB-255646/2 ..... N77-12551 #
PB-255652/0 ..... N77-12545 #
PB-255672/8 ..... N77-12844*#
PB-255693/4 ..... N77-12953 #
PB-255698/3 ..... N77-12590 #
PB-255708/0 ..... N77-12220*#
PB-255718/9 ..... N77-12596 #
PB-255730/4 ..... N77-12589 #
PB-255765/0 ..... N77-12528 #
PB-255768/4 ..... N77-12318 #
PB-255817/9 ..... N77-12591 #
PB-255821/1 ..... N77-12550 #
PB-255839/3 ..... N77-12035 #
PB-255855/9 ..... N77-12549 #
PB-255862/5 ..... N77-12633 #
PB-255875/7 ..... N77-12268 #
PB-255903/7 ..... N77-12548 #
PB-255904/5 ..... N77-12269 #
PB-255927/6 ..... N77-12592 #
PB-255937/5 ..... N77-12587 #
PB-255939/1 ..... N77-12267 #
PB-255948/2 ..... N77-12500 #
PB-255955/7 ..... N77-12456 #
PB-255956/5 ..... N77-12581 #
PB-255960/7 ..... N77-12948 #
PB-255984/7 ..... N77-12595 #
PB-255986/2 ..... N77-12225 #
PB-255991/2 ..... N77-12530 #
PB-255992/0 ..... N77-12531 #
PB-255993/8 ..... N77-12532 #
PB-255994/6 ..... N77-12533 #
PB-255995/3 ..... N77-12534 #
PB-256015/9 ..... N77-12458 #
PB-256020/9 ..... N77-12231 #
PB-256034/0 ..... N77-12554 #
PB-256050/6 ..... N77-12414 #
PB-256052/2 ..... N77-12205 #
PB-256053/0 ..... N77-12204 #
PB-256054/8 ..... N77-12165 #
PB-256056/3 ..... N77-12416 #
PB-256057/1 ..... N77-12415 #
PB-256067/0 ..... N77-12271 #
PB-256070/4 ..... N77-12544 #
PB-256093/6 ..... N77-12547 #
PB-256094/4 ..... N77-12270 #
PB-256098/5 ..... N77-12759 #
PB-256117/3 ..... N77-12536 #
PB-256138/9 ..... N77-12377 #
PB-256155/3 ..... N77-12555 #
PB-256201/5 ..... N77-12949 #
PB-256204/9 ..... N77-12583 #
PB-256212/2 ..... N77-12582 #
PB-256241/1 ..... N77-12584 #
PB-256252/8 ..... N77-12167 #
PB-256254/4 ..... N77-12546 #
PB-256261/9 ..... N77-12266 #
PB-256264/3 ..... N77-12166 #
PB-256296/5 ..... N77-12224 #
PB-256319/5 ..... N77-12376 #
PB-256329/4 ..... N77-12202 #
PB-256335/1 ..... N77-12601 #
PB-256338/5 ..... N77-12585 #
PB-256378/1 ..... N77-12586 #
PB-256394/8 ..... N77-12501 #
PB-256397/1 ..... N77-12575 #
PB-256403/7 ..... N77-12537 #
PB-256412/8 ..... N77-12574 #
PB-256424/3 ..... N77-12576 #
PB-256440/9 ..... N77-12737 #
PB-256447/4 ..... N77-12577 #
PB-256475/5 ..... N77-12761 #
PB-256480/5 ..... N77-12346 #
PB-256481/3 ..... N77-12345 #
PB-256512/5 ..... N77-12593 #
PB-256513/3 ..... N77-12594 #
PB-256518/2 ..... N77-12951 #
PB-256525/7 ..... N77-12773 #
PB-256541/4 ..... N77-12322 #
PB-256564/6 ..... N77-12939 #
PB-256565/3 ..... N77-12940 #
PB-256566/1 ..... N77-12941 #
PB-256583/6 ..... N77-12944 #
PB-256599/2 ..... N77-12706 #
PB-256615/6 ..... N77-12538 #
PB-256636/2 ..... N77-12952 #
PB-256653/7 ..... N77-12588 #
PB-256664 ..... N77-12950 #
PB-256668/5 ..... N77-12497 #
PB-256671/9 ..... N77-12494 #
PB-256692/5 ..... N77-12760 #
PB-256693/3 ..... N77-12758 #
PB-256699/0 ..... N77-12499 #
PB-256708/9 ..... N77-12578 #
PB-256717/0 ..... N77-12658 #
PB-256754/3 ..... N77-12378 #
PB-256756/8 ..... N77-12632 #
PB-256765/9 ..... N77-12495 #
PB-256784/0 ..... N77-12600 #
PB-256802/0 ..... N77-12496 #
PB-256820/2 ..... N77-12945 #

PB-256822/8 ..... N77-12729 #
PB-256823/6 ..... N77-12730 #
PB-256824/4 ..... N77-12657 #
PB-256829/3 ..... N77-12942 #
PB-256846/7 ..... N77-12946 #
PB-256976/2 ..... N77-12947 #
PB-256995/2 ..... N77-12455 #
PB-256997/8 ..... N77-12203 #

PL-21-VR76-0507 ..... N77-12372 #

PM/76/5 ..... N77-12848 #
PM/76/6 ..... N77-12794 #

POLY-EE/EP-76-003 ..... N77-12749 #

POLY-SMART-101 ..... N77-12749 #

PRJEW026-1 ..... N77-12596 #

PRRL-76-CR-5 ..... N77-12871 #

PWA-75-200-4017-2 ..... N77-12193 #
PWA-5277 ..... N77-12061 #

QPR-2 ..... N77-12323 #
QPR-3 ..... N77-12553 #
QPR-5 ..... N77-12475*#
QPR-6 ..... N77-12766 #

QR-3 ..... N77-12586 #
QR-16 ..... N77-12307 #

R-1-76 ..... N77-12723 #
R-2-75 ..... N77-12818 #
R-4-76 ..... N77-12768 #
R-76-912801-4 ..... N77-12137 #
R-166 ..... N77-12250 #
R-706 ..... N77-12726 #
R-723 ..... N77-12725 #
R-724 ..... N77-12116 #
R-726 ..... N77-12895 #
R-728 ..... N77-12747 #
R-1854-PR ..... N77-12929 #
R-7518 ..... N77-12440 #

RAC-MDR-2 ..... N77-12300 #

RADC-TR-72-341 ..... N77-12395 #
RADC-TR-73-95 ..... N77-12280 #
RADC-TR-76-31 ..... N77-12727 #
RADC-TR-76-53 ..... N77-12252 #
RADC-TR-76-56 ..... N77-12765 #
RADC-TR-76-72 ..... N77-12911 #
RADC-TR-76-82 ..... N77-12226 #
RADC-TR-76-88 ..... N77-12312 #
RADC-TR-76-92 ..... N77-12762 #
RADC-TR-76-94 ..... N77-12896 #
RADC-TR-76-95 ..... N77-12411 #
RADC-TR-76-99 ..... N77-12401 #
RADC-TR-76-101-VOL-1 ..... N77-12304 #
RADC-TR-76-101-VOL-2 ..... N77-12305 #
RADC-TR-76-108 ..... N77-12774 #
RADC-TR-76-111 ..... N77-12389 #
RADC-TR-76-112 ..... N77-12870 #
RADC-TR-76-119 ..... N77-12315 #
RADC-TR-76-121 ..... N77-12498 #
RADC-TR-76-125 ..... N77-12902 #
RADC-TR-76-127 ..... N77-12316 #
RADC-TR-76-128 ..... N77-12900 #
RADC-TR-76-136 ..... N77-12274 #
RADC-TR-76-143 ..... N77-12749 #
RADC-TR-76-151 ..... N77-12373 #

RAE-TR-75090 ..... N77-12067 #

RAH-070-VOL-2 ..... N77-12532 #
RAH-070A-VOL-1 ..... N77-12531 #

RD-76-22 ..... N77-12006 #

RDR-1788-2 ..... N77-12054 #
RDR-1811 ..... N77-12139 #

RE-76-26 ..... N77-12282 #

REPT-1 ..... N77-12496 #
REPT-68 ..... N77-12405 #
REPT-69 ..... N77-12681 #

REPT-75-90 ..... N77-12877 #
REPT-76-SM-6 ..... N77-12140 #
REPT-76-9G9-TFSOL-R2 ..... N77-12553 #
REPT-76-112-1 ..... N77-12476*#
REPT-76-112-2 ..... N77-12477*#
REPT-76-113-1 ..... N77-12478*#
REPT-76AEG272 ..... N77-12041*#
REPT-273-C ..... N77-12572 #
REPT-380-4686F ..... N77-12539 #
REPT-1503 ..... N77-12510*#
REPT-1733-2 ..... N77-12689 #
REPT-1976-8 ..... N77-12985 #
REPT-76001 ..... N77-12127 #
REPT-635167 ..... N77-12443 #

RG-76-41 ..... N77-12102 #
RG-76-55 ..... N77-12104 #
RG-76-59 ..... N77-12320 #

RIA-R-TR-76-005 ..... N77-12044 #

RL-76-14 ..... N77-12142 #

RR-76-SM-9 ..... N77-12136 #
RR-76-2 ..... N77-12584 #
RR-76-2 ..... N77-12770 #
RR-76-6 ..... N77-12796 #
RR-94 ..... N77-12938 #
RR-386 ..... N77-12828 #
RR-388 ..... N77-12799 #
RR-389 ..... N77-12798 #
RR-390 ..... N77-12746 #
RR-392 ..... N77-12797 #

RSL-TR-177-62 ..... N77-12243*#

RT-8137-003 ..... N77-12257 #

R76EMH5 ..... N77-12314 #

S-459 ..... N77-12931 #

SAC-NR-76-01 ..... N77-12007 #

SAM-TR-14 ..... N77-12073 #

SAMSO-TR-75-255-VOL-4 ..... N77-12755 #
SAMSO-TR-76-79 ..... N77-12868 #
SAMSO-TR-76-111 ..... N77-12105 #

SATR-3 ..... N77-12896 #

SCIENTIFIC-2 ..... N77-12902 #

SC5008.2F ..... N77-12207 #

SD-76-SA-0029 ..... N77-12083*#

SDAC-TR-75-16 ..... N77-12622 #

SER-50956 ..... N77-12045 #

SIT-DL-76-1874 ..... N77-12011 #

SM/894/D ..... N77-12416 #

SORI-EAS-76-061 ..... N77-12595 #

SORI-3489-V ..... N77-12595 #

SP-01R76 ..... N77-12125 #

SPO-30348 ..... N77-12365*#

SQUID-TR-MICH-15-PU ..... N77-12340 #

SR-JJK-75-008-1 ..... N77-12264 #

SR-1 ..... N77-12117 #
SR-1 ..... N77-12257 #
SR-1 ..... N77-12274 #
SR-1 ..... N77-12618 #
SR-1 ..... N77-12649 #
SR-2 ..... N77-12626 #
SR-2 ..... N77-12653 #
SR-3 ..... N77-12350 #
SR-3 ..... N77-12629 #
SR-14 ..... N77-12880 #

SRDE-76002 ..... N77-12249 #

SRI-EGU-3505-UR-1-VOL-1 ..... N77-12533 #
SRI-EGU-3505-VOL-2 ..... N77-12534 #

SRI-JSR-75-13 ..... N77-12807 #

SRI-MP-76-48 ..... N77-12163 #

SSS-R-76-2753 ..... N77-12192 #

SU-HTGL-104 ..... N77-12879 #

SU-SEL-75-034 ..... N77-12303 #

SU-TN-68 ..... N77-12261 #
SU-TN-79 ..... N77-12262 #
SU-TN-83 ..... N77-12260 #

SU-TR-226 ..... N77-12809 #
SU-TR-228 ..... N77-12823 #
SU-TR-230 ..... N77-12808 #
SU-TR-231 ..... N77-12821 #
SU-TR-232 ..... N77-12820 #

SVHSER-6786 ..... N77-12126 #

SWR-135 ..... N77-12586 #

T-624 ..... N77-12410 #

TAR-2 ..... N77-12308 #

TD-24 ..... N77-12421 #

THA/320/RWO/JS-PT-1/2 ..... N77-12769 #

TK-75-0016 ..... N77-12587 #

TM-42 ..... N77-12606*#
TM-43 ..... N77-12029*#
TM-44 ..... N77-12030*#
TM-75-201 ..... N77-12464 #
TM-75-246 ..... N77-12201 #
TM-75-255 ..... N77-12344 #
TM-75-284 ..... N77-12919 #

TN-25-75 ..... N77-12753 #
TN-147 ..... N77-12559 #
TN-150 ..... N77-12640 #
TN-1976-20 ..... N77-12302 #

TR-CS-76-5 ..... N77-12748 #

TR-1 ..... N77-12325 #
TR-1 ..... N77-12598 #
TR-3-AFOSR ..... N77-12811 #
TR-4 ..... N77-12822 #
TR-5 ..... N77-12466 #
TR-5 ..... N77-12542 #
TR-7 ..... N77-12665 #
TR-8 ..... N77-12447 #
TR-8 ..... N77-12862 #
TR-9 ..... N77-12169 #
TR-12/75 ..... N77-12913 #
TR-15 ..... N77-12734 #
TR-16 ..... N77-12802 #
TR-25 ..... N77-12454 #
TR-27-REV ..... N77-12253 #
TR-34 ..... N77-12229 #
TR-39 ..... N77-12136 #
TR-56 ..... N77-12811 #
TR-105 ..... N77-12254 #
TR-176 ..... N77-12777 #
TR-490 ..... N77-12036 #
TR-548-2 ..... N77-12112*#
TR-0076(6270-20)-5 ..... N77-12868 #
TR-0076(6666)-1-VOL-4 ..... N77-12755 #
TR-0076(6793)-1 ..... N77-12105 #
TR-0077(2260-20)-4 ..... N77-12989*#
TR-1072-1 ..... N77-12055*#

TRB/NCHRP/SYN-36 ..... N77-12377 #

TRITA-FPT-022 ..... N77-12331 #

TRW-26148-6004-RU-00 ..... N77-12182*#

T211-RP-032 ..... N77-12068*#

U-OF-IOWA-76-12 ..... N77-12620*#

UAH-RR-193 ..... N77-12638*#
UAH-RR-194 ..... N77-12183*#

UCID-17086 ..... N77-12506 #
UCID-30128 ..... N77-12722 #

UCLA-ENG-7608 ..... N77-12288 #
UCLA-ENG-7624 ..... N77-12451 #

UCRL-5196-REV-1 ..... N77-12525 #
UCRL-77896 ..... N77-12790 #

UHMET-75-02 ..... N77-12656 #

UILU-ENG-75-2242 ..... N77-12726 #
UILU-ENG-76-2212 ..... N77-12116 #
UILU-ENG-76-2214 ..... N77-12895 #
UILU-ENG-76-2216 ..... N77-12747 #

ULRF-377/IP ..... N77-12630 #

UM-HSRI-76-10 ..... N77-12702 #

UMTA-CA-06-0071-76-1 ..... N77-12946 #

UMTA-IT-09-0023-76-1 ..... N77-12952 #

UMTA-VA-06-0024-76-2 ..... N77-12945 #

UNC-SG-76-04 ..... N77-12547 #

US-PATENT-APPL-SN-495022 ..... N77-12721*
US-PATENT-APPL-SN-545283 ..... N77-12239*
US-PATENT-APPL-SN-589173 ..... N77-12240*
US-PATENT-APPL-SN-591569 ..... N77-12402*
US-PATENT-APPL-SN-736286 ..... N77-12247*#
US-PATENT-APPL-SN-737975 ..... N77-12248*#
US-PATENT-APPL-SN-744542 ..... N77-12332*#
US-PATENT-APPL-SN-744573 ..... N77-12511*#
US-PATENT-APPL-SN-744574 ..... N77-12157*#
US-PATENT-APPL-SN-746578 ..... N77-12070*#
US-PATENT-APPL-SN-749420 ..... N77-12031*#

US-PATENT-CLASS-60-527 ..... N77-12402*
US-PATENT-CLASS-179-15BA N77-12721*
US-PATENT-CLASS-325-41 ..... N77-12240*
US-PATENT-CLASS-328-111 ..... N77-12721*
US-PATENT-CLASS-340-146.1AL N77-12240*
US-PATENT-CLASS-340-146.1AQ N77-12240*
US-PATENT-CLASS-340-146.1AV N77-12240*
US-PATENT-CLASS-340-172.5 ..... N77-12721*
US-PATENT-CLASS-340-347DD N77-12239*

US-PATENT-3,987,630 ..... N77-12402*
US-PATENT-3,988,677 ..... N77-12240*
US-PATENT-3,988,716 ..... N77-12721*
US-PATENT-3,988,729 ..... N77-12239*

USAAEFA-74-34 ..... N77-12043 #
USAAEFA-75-11 ..... N77-12042 #

USAAMRDL-TR-75-56A ..... N77-12052 #
USAAMRDL-TR-76-1 ..... N77-12063 #
USAAMRDL-TR-76-4 ..... N77-12045 #
USAAMRDL-TR-76-8 ..... N77-12046 #

USAARL-76-15 ..... N77-12704 #
USAARL-76-18 ..... N77-12579 #
USAARL-76-19 ..... N77-12688 #
USAARL-76-20 ..... N77-12860 #

USAMC-ITC-02-08-75-114 ..... N77-12698 #
USAMC-ITC-02-28-75-102 ..... N77-12450 #

USARIEM-T-23/76 ..... N77-12696 #

USC-A-1 ..... N77-12512*#

USCG-D-37-76 ..... N77-12425 #
USCG-D-42-76 ..... N77-12573 #
USCG-D-51-76 ..... N77-12050 #
USCG-D-55-76 ..... N77-12572 #
USCG-D-59-76 ..... N77-12569 #
USCG-D-186-75 ..... N77-12034 #

USGS-GD-76-003 ..... N77-12795 #
USGS-GD-76-012 ..... N77-12758 #
USGS-GD-76-013 ..... N77-12760 #

USGS-LI-76/001 ..... N77-12488 #

USGS/WDR/AR-75/1 ..... N77-12494 #
USGS/WDR/HI-75/1 ..... N77-12497 #
USGS/WDR/MO-75/1 ..... N77-12495 #
USGS/WDR/NJ-75/1 ..... N77-12496 #
USGS/WRD/HD-76/020 ..... N77-12496 #
USGS/WRD/HD-76/021 ..... N77-12497 #
USGS/WRD/HD-76/022 ..... N77-12494 #
USGS/WRD/HD-76/031 ..... N77-12495 #

UTIAS-TN-203 ..... N77-12010 #

VHTRC-76-R50 ..... N77-12456 #

VPI-AERO-023 ..... N77-12707 #
VPI-AERO-050 ..... N77-12337 #

VTH-176 ..... N77-12100 #

W-06115 ..... N77-12315 #

WES-INSTRUCTION-S-76-1 ..... N77-12920 #

WES-TR-6-570-5 ..... N77-12462 #

WMO-431 ..... N77-12559 #
WMO-441 ..... N77-12640 #

WP-62-75-76 ..... N77-12799 #
WP-64-75-76 ..... N77-12746 #

WPL-43 ..... N77-12759 #

WVT-TR-75019 ..... N77-12208 #
WVT-TR-76012 ..... N77-12189 #

W76-09716 ..... N77-12938 #
W76-09760 ..... N77-12563 #
W76-10815 ..... N77-12596 #
W76-11105 ..... N77-12582 #
W76-11114 ..... N77-12584 #
W76-11170 ..... N77-12594 #
W76-11171 ..... N77-12593 #
W76-11175 ..... N77-12940 #
W76-11176 ..... N77-12939 #
W76-11177 ..... N77-12941 #
W76-11337 ..... N77-12944 #

X-602-76-257 ..... N77-12857*#

X75-1095/301 ..... N77-12246 #
X76-979/301 ..... N77-12245 #
X76-1117/034A ..... N77-12858 #

☆U.S. GOVERNMENT PRINTING OFFICE: 1977-241-022/3

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

OKLAHOMA
University of Oklahoma, Bizzell Library

PENNSYLVANIA
Carnegie Library of Pittsburgh

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library

MISSOURI
Kansas City Public Library
St. Louis Public Library

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

TENNESSEE
Memphis Public Library

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, New York 10017.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESA - Space Documentation Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

SPECIAL FOURTH CLASS MAIL
Book

POSTAGE AND FEES PAID
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
NASA-451

U.S.MAIL

POSTMASTER: If undeliverable (Section 158 Postal Manual) Do Not Return

n 158
Return